The Canadian Medical Association Journal

Vol. 55 TORONTO, NOVEMBER, 1946 No. 5

ASCORBIC ACID METABOLISM AFTER TRAUMA IN MAN*

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FOR centuries it has been realized that in scorbutic patients the healing process is retarded and that reopening of old wounds and the refracture of bones may occur. The recent experiment of Crandon *et al.*[11, 12] on a human subject demonstrated beyond doubt that wound healing is impaired on an ascorbic acid-deficient diet; a condition which can be promptly corrected by the administration of large doses of ascorbic acid.

However, the physiological rôle of ascorbic acid in the acutely injured patient is still obscure. Experimental work with guinea pigs has produced certain clues as to the action of ascorbic acid in the tissues of these animals. Histological studies on experimentally injured, scorbutic guinea pigs demonstrated the complete failure of callus formation as well as the resorption of old callus. Furthermore, there was no formation of reticulum and collagen.[34, 35] Laneman[19] showed that the tensile strength of the healing wound in vitamin C deficient guinea pigs is considerably lower than in the normal animal and Bartlett[2] reported a greater ascorbic acid content in the scar area of scorbutic guinea pigs at low vitamin C levels than in the surrounding tissues. This differentiation could not be demonstrated on a medium or high intake. Bourne[4, 5] showed that bone healing in guinea pigs is only retarded when the ascorbic acid intake is very low. The injection of calcium ascorbate accelerated the healing of experimental bone injuries in rats while calcium gluconate was ineffective, and this was interpreted as a specific rôle of ascorbic acid in the calcium deposition in the healing bone.

Lund and Crandon[25, 26] studied the vitamin C status of ward patients with delayed wound healing and found that the blood ascorbic acid approached zero level. In the opinion of these workers, the low blood ascorbic acid content was not a proof of an increased ascorbic acid requirement, but was ascribed to the low ascorbic acid intake in these patients prior to injury. It was further noted that the administration of ascorbic acid caused the return of the blood ascorbic acid content to normal levels more quickly than was observed in uninjured, scorbutic patients. They considered that the impaired healing which was also observed in these patients could be ascribed to the operative technique and was not necessarily due to the ascorbic acid depletion of the tissues.

From the evidence obtained with guinea pig experiments and from observations on twenty-eight clinical cases, Hunt[17] suggested that all patients should receive 1,000 mgm. ascorbic acid for three days prior to operation and 100 mgm. thereafter. However, this amount was arbitrarily chosen; there is no direct experimental evidence that this amount is required. Levenson, Green, Taylor, Robinson, Page, Johnson and Lund[20] have carried out vitamin balance studies on patients after injury and burns and found an increased ascorbic acid retention. They believe that 225 mgm. ascorbic acid daily may not be sufficient to meet the demand of surgical patients and that 500 to 1,000 mgm. represent a more correct estimate of the ascorbic acid requirement in damage.

Ascorbic acid metabolism was studied in normal individuals by van Eekeln[13] who recognized the interdependence between the dietary vitamin C intake, the plasma ascorbic acid, and the ascorbic acid excretion. On a low intake the plasma level was also low; on a raised intake the plasma level rose up to 1.3 mgm. but not above this level. The latter condition

* This work was aided by a grant from the Associate Committee on Army Medical Research, National Research Council of Canada.

The ascorbic acid used in these studies was Redoxon of Hoffmann-LaRoche in Canada, and provided through the courtesy of Dr. Ruth Wolfe.

was termed the "state of ascorbic acid saturation". From balance experiments on the same individual, van Eekeln calculated the average daily ascorbic acid retention and noted that at plasma levels below the saturation point the retention decreased. Recently Melnick *et al.*[27] have developed a technique to assess the availability of ingested ascorbic acid in normal, ascorbic acid saturated subjects. A standard diet providing a constant intake of 115 mgm. ascorbic acid was given throughout the experimental period. On this intake about 30 mgm. were excreted. On an ascorbic acid intake above the basal intake, there was a proportionate increase in ascorbic acid excretion which amounted to 65% of the ingested dose. The patients reported in the present paper were also maintained in a state of ascorbic acid saturation. This was accomplished by raising the daily intake by administration of crystalline ascorbic acid. Any change in the ascorbic acid retention was then ascribed to metabolic changes in the patient during the period of study. The degree of tissue saturation was assessed from ascorbic acid determinations of whole blood and white cells at frequent intervals.

The difficulty of assessing the function of ascorbic acid in traumatized individuals lies in the inherent complexity of biological research in humans, due, in great part to the diversity of the clinical and nutritional background of individual patients. Most of the earlier clinical observations dealt with injuries in patients suffering overt scurvy; little is yet known about the ascorbic acid metabolism in the patient of average nutrition at the time of admission to hospital. The present study deals with the ascorbic acid metabolism in patients of the latter type. Preliminary reports were presented at the Macy Conference[6] and the Canadian Physiological Society.[1]

METHODS

The dietary intake of the patients was rigorously controlled throughout the metabolic studies. The food was prepared in a special diet kitchen: each constituent was weighed before serving and careful notes were taken of any returns to ensure accurate records of the daily intake. The amount of vitamins ingested was estimated from the National Research Council Washington Tables, 1943.[29] The difference between the desired level of vitamin intake and the quantity furnished by the diet was administered in the form of vitamin tablets. The daily vitamin supplements were given in three divided doses at meal times. The efficacy of estimating the dietary ascorbic acid intake by the N.R.C. Washington tables under the condition of the hospital diet kitchen was tested by comparison of the calculated amounts with those of chemical analysis. Aliquots of eight daily diets, fortified with ascorbic acid tablets and 53 individual foods were mixed with seven parts of 3% metaphosphoric acid to three parts of material. The mixture was homogenized in a Waring blender and weighed. A portion of the pulp was centrifuged and the clear supernatant liquid analyzed for reduced ascorbic acid by the same method as for the urine analysis. The results obtained from food tables were on the average 7% higher than when estimated chemically.

Twenty-four hour urine specimens were collected in dark bottles containing 75 ml. of 10% oxalic acid. The urine bottle was placed in a covered box beside the patient's bed and emptied every morning at 8 o'clock after the last voiding.

The reduced ascorbic acid was determined by the colorimetric method of Evelyn *et al.*[14] The total ascorbic acid in the urine was determined by the method of Roe and Kuether.[30]

The ascorbic acid content in whole blood and white cells was carried out by the method of Butler, Cushman and McLachlan.[9]

CASE REPORTS AND RESULTS

Three normal controls, 14 cases of fractures and 7 cases of burns were studied. The metabolic data are presented in Table I for all cases and in Figs. 1 to 6 for cases 92, 113, 119, 131, 135 and 142.

Clinical details are omitted for lack of space but are available on application to the authors.

DISCUSSION

A low ascorbic acid excretion, relative to the intake, characterizes the ascorbic acid metabolism of burn and fracture patients of this study during the period immediately after injury. This response could be best demonstrated when the daily vitamin C intake was maintained at a high and constant level throughout the metabolic studies by supplementation with

crystalline ascorbic acid. On such a regimen the patient's ascorbic acid status changed from a state of depletion as caused by the injury into a state of saturation which could be recognized by (*a*) a rise in the blood ascorbic acid content from below 0.2 to about 0.7 mgm. % and (*b*) an abrupt decline in the ascorbic acid retention.

The period which elapsed before saturation was achieved depended primarily upon the ascorbic acid dose and to a lesser extent upon the degree of injury while the total amount of retained ascorbic acid was independent of the dose. It was found that generally more ascorbic acid was retained after burns than after fractures.

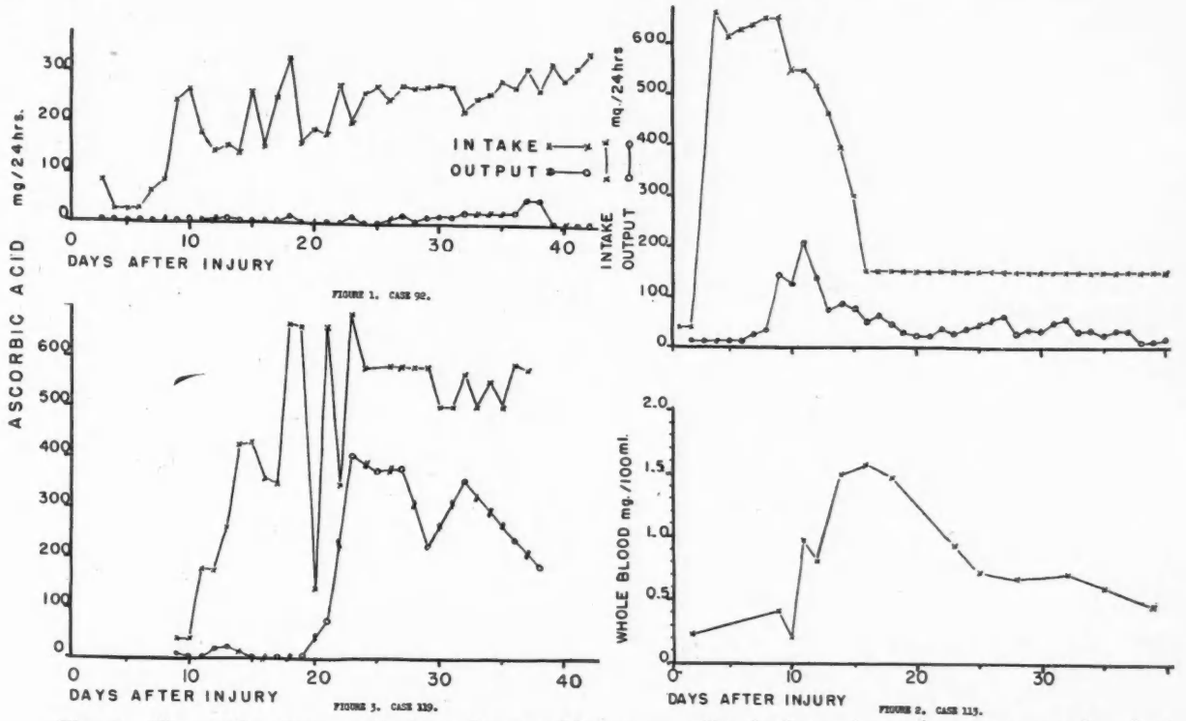

Fig. 1. (Case 92).—Burn patient, male, age 36 years, suffered flame burns on arms, neck, chest, buttock and thigh. **Fig. 3.** (Case 119).—Burn patient, female, age 32 years, suffered hot water burn from the calves of the leg up to the breast. **Fig. 2.** (Case 113).—Fracture patient, male, age 23 years, suffered fractures of femur and ulna, and laceration of buttock, knee and hand.

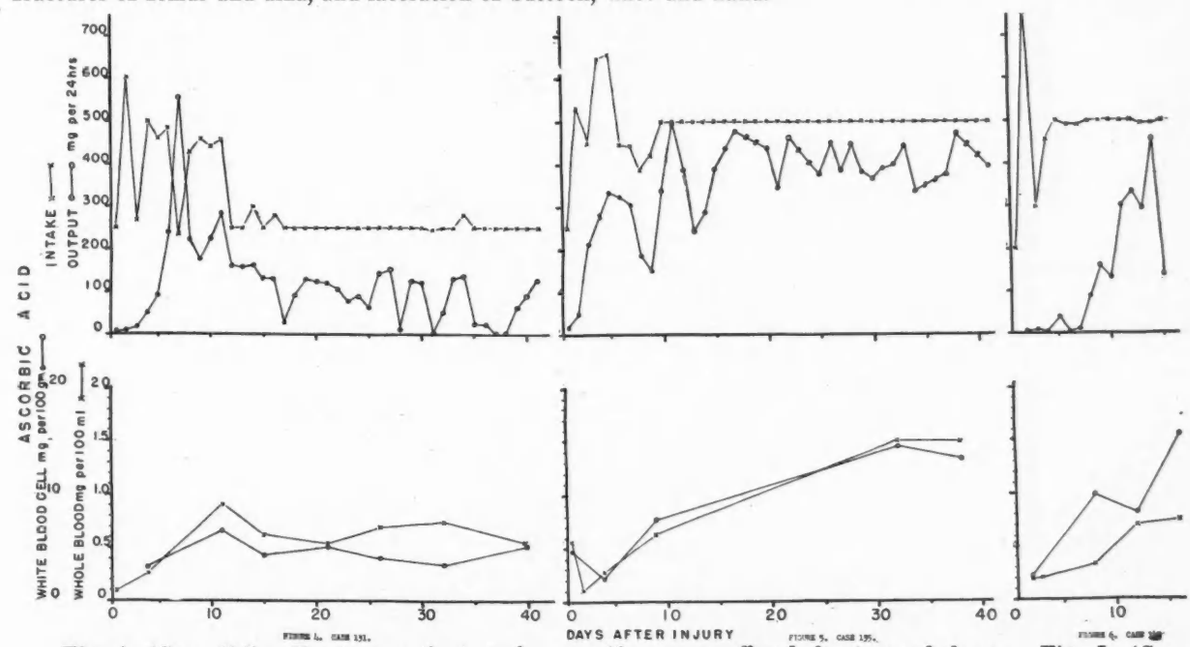

Fig. 4. (Case 131).—Fracture patient, male, age 42 years, suffered fracture of femur. **Fig. 5.** (Case 135).—Burn patient, male, age 61 years, suffered steam burn over legs and forearms. **Fig. 6.** (Case 142).—Fracture patient, male, age 36 years, suffered fracture of fibula and tibia.

TABLE I.

THE AVERAGE RETENTION OF ASCORBIC ACID AND THE WHOLE BLOOD ASCORBIC ACID CONTENT OF NORMAL AND TRAUMATIZED PATIENTS

		*Period of non-saturation***				*Period of saturation*			
Case	*Injury* ***	*Days**	*Average intake mgm. 24 hrs.*	*Average retention mgm. 24 hrs.*	*Whole blood level mgm. % (Days*)*	*Days**	*Average intake mgm. 24 hrs.*	*Average retention mgm. 24 hrs.*	*Whole blood level mgm. % (Days*)*
115	N	Nil	..	..	....	1-17	150	59	0.37 (1), 0.63 (5) 0.46 (10)
116	N	1	150	131	....	2-14	150	74	0.71 (4), 0.53 (8), 0.94 (11)
138	N	1	500	464	0.32 (1)	2-18	470	120	0.92 (5), 0.74 (15)
138	N	1	500	294	....	2- 7	500	123	0.79 (2), 0.86 (4), 1.10(6)
80	F	12-23	330	Not studied	....	24-88	412	132	0.97 (40)
86	F	6-20	332	276	....	21-31	429	196	0.91 (21)
87	F	10-31	139	129	....	32-99	268	158	0.76 (32)
88	F	8-22	106	97	....	23-49	152	103	0.75 (28)
92	B	8-39	258	242	....				
113	F	3-9	628	568	0.21 (2), 0.42 (9), 0.21 (10)	16-42	150	116	1.59 (16), 1.49 (18), 0.94 (23), 0.73 (25), 0.68 (28)
117	F	7-16	150	141	0.14 (7), 0.24 (10), 0.32 (16)				
119	B	11-22	386	373	....	23-36	550	243	....
128	B	3-8	520	509	....	9-16	520	151	....
131	F	2-5	457	416	0.11 (1), 0.26 (4)	6-46	278	159	0.9 (11), 0.63 (15), 0.53 (21), 0.7 (26), 0.74 (32), 0.54 (40)
134	B	1-3	1,031	911	0.30 (1), 0.08 (2)	5-30	1,030	245	0.86 (4), 1.2 (8), 0.96 (15), 0.67 (23), 1.7 (31)
135	B	1-3	409	313	0.56 (1), 0.10 (2), 0.28 (4)	5-54	519	145	0.64 (9), 1.5 (32), 1.5 (38), 0.9 (45), 0.79 (54)
136	B	1-3	990	915	0.34 (1), 0.03 (2)	5-54	998	208	0.81 (4), 1.0 (8), 1.2 (15), 0.78 (23), 1.7 (32), 1.6 (38)
140	F	1-10	495	428	0.09 (4), 0.64 (7)	11-56	480	196	1.1 (11), 1.2 (20), 0.57 (34)
142	F	1-10	472	427	0.20 (2), 0.22 (3), 0.33 (8)	11-15	498	94	0.7 (12), 0.74 (16)
148	F	1-4	452	423	0.24 (1), 0.19 (2), 0.54 (4)	5-19	520	168	0.45 (7), 1.1 (15)
149	F	3-5	500	470	0.32 (2)	6-26	500	271	1.0 (6), 0.86 (10), 1.1 (19)
155	F	5-9	545	506	....	10-27	492	244	....
89	B	58	134	128	....	59-125	160	126	....
120	F	102	368	312	....	103-146	264	110	....
124	F	107-109	499	249	....	110-132	140	116	....

* For normals—Days of metabolic study.
For patients—Days after injury; the first day recorded designates the beginning of the metabolic study

** Period from beginning of the metabolic study until a rise in urinary ascorbic acid occurred.

*** N—Normal. F—Fracture. B—Burn.

Various factors which could result in an increased retention of ascorbic acid independently of the physiological need of ascorbic acid at that time were investigated, namely: (*a*) loss of ascorbic acid during storage of the urine before analysis; (*b*) excretion of ascorbic acid in the reversibly oxidized form, dehydroascorbic acid; (*c*) failure of absorption of ascorbic acid from the intestine; (*d*) impaired excretion immediately after injury; (*e*) retention of ascorbic acid in the œdema fluid; (*f*) loss of ascorbic acid through the blister fluid; (*g*) nutritional deficiency of ascorbic acid prior to the injury.

The stability of ascorbic acid in urine of normal and injured patients was tested. Oxalic acid was added in all cases to the urine collection bottles. The loss of ascorbic acid in both groups varied from 0 to 10% within 24 hours at room temperature, thus excluding the presence of compounds in the urine of damaged patients which might have hastened the destruction of ascorbic acid.

The ascorbic acid determinations in most cases were carried out for reduced ascorbic acid only. In order to determine whether the low excretion of reduced ascorbic acid was due to increased excretion of the dehydro form, the urine of three burn and three fracture cases was analyzed for total ascorbic acid by the Roe *et al.*, method.[30] The quantitative difference between the method for total and reduced ascorbic acid represents the amount of dehydroascorbic acid in the urine. In these cases the dehydroascorbic acid represented from zero to 56% of the total ascorbic acid immediately after injury and from zero to 22% during late stages of convalescence. Negative values for dehydroascorbic acid also occurred. Beryman *et al.*,[3] have determined the total and reduced ascorbic acid in the urine of 68 soldiers during a six-hour period following administration of 200 mgm. ascorbic acid. They found that the proportion of dehydro to reduced ascorbic acid remained constant at various excretion levels and that the dehydroascorbic acid constituted 18% of the total ascorbic acid in normal subjects. Muntoni[28] has shown that after surgical operations, the ratio of dehydro to reduced ascorbic acid increased. Our results indicated that the partition of reduced and dehydro urinary ascorbic acid in damage did not differ greatly from normals during the period of convalescence, but was increased during the early period of damage. The absolute amount of dehydroascorbic acid was still small however. Thus the low reduced ascorbic acid excretion cannot be explained on the basis of a large excretion of dehydroascorbic acid.

The daily loss of unabsorbed ascorbic acid in the fæces was not determined in these investigations but is normally small. With intakes varying from 73 to 1,054 mgm. Chinn and Farmer[10] found the fæcal excretion to average between 5 and 14 mgm. The ascorbic acid loss in the fæces during diarrhœa was much larger, (Farmer *et al.*,).[15] Furthermore, destruction of ascorbic acid by bacteria common to the intestinal tract could be demonstrated by Kendall and Chinn[18] to be slight. All patients in the present study received oral doses of ascorbic acid except case 128 who received daily 500 mgm. ascorbic acid intramuscularly. The vitamin doses of cases 134, 135, and 136 on the evening of admission was also given intramuscularly. Despite the different route of administration, these patients showed the same initial low ascorbic acid excretion.

Certain information regarding the fate of the retained ascorbic acid could be derived from the blood ascorbic acid studies. A repetition of the blood analysis on cases 134, 135 and 136 twenty hours after admission indicated that the blood ascorbic acid had fallen from 0.30, 0.56 and 0.34 mgm. % to 0.08, 0.10 and 0.03 mgm. % respectively. This occurred in spite of the administration of 500, 250 and 500 mgm. ascorbic acid twelve hours prior to the collection of the second blood sample. Blood ascorbic acid values below 0.25 mgm. % were also found in the fracture cases 113, 131, 140, 142 and 148, after the first day of injury. All these findings point towards an immediate rapid ascorbic acid utilization or destruction resulting in the depletion of the body's store, as well as the disappearance of ingested ascorbic acid.

While a low ascorbic acid excretion in uninjured subjects signifies a state of ascorbic acid depletion, the low excretion observed in patients immediately after injury does not necessarily permit the same conclusion. Here the picture may be complicated by an impaired excretion of ascorbic acid, retention in the œdema fluid, or loss in the blister fluid. In these studies a low blood ascorbic acid content always appeared 24 hours after injury, and it

was not until the blood ascorbic acid began to rise that the urinary excretion of ascorbic acid increased. The close correlation between urinary excretion and blood ascorbic acid thus eliminates impaired kidney function as the possible cause of low ascorbic acid excretion, but still leaves the question of ascorbic acid retention in the extra-cellular fluid for consideration. It was observed that during the period following injury, the urine volume and the ascorbic acid excretion were both low. At such a time a low urine volume signifies œdema fluid formation. When after several days the urine volume showed a marked rise, the ascorbic acid excretion did not show a concommitant augmentation.

In addition to early fluid retention and later discharge of œdema fluid, there is in burns a continuous seepage from the burn area. The magnitude of ascorbie acid loss by this route could not be estimated by direct analysis of blister fluid in these patients because of the prompt application of pressure bandages to the burned areas on admission. However, it could be shown that blister fluid, from blisters raised experimentally with cantharides as the irritant, contained vitamin C at about the same concentration as in the plasma at the time of blister formation. The magnitude of the ascorbic acid loss in blister fluid in our patients must be very small, as the daily loss of one or even two litres of fluid would not account for more than 10 to 20 mgm. ascorbic acid.

According to Butler and Cushman[7, 8, 9] the white cell ascorbic acid is an index of the ascorbic acid content of the body tissues. We have determined the white cell ascorbic acid content of acutely damaged patients in order to investigate whether this vitamin was still present in the tissue cells during the period when there was little in the blood and urine.

The white cell ascorbic acid content of twelve normal subjects was first determined in order to establish a normal range. The white cell ascorbic acid content was found to fall between 6.7 and 16.9 mgm. %. These values are much lower than those reported by Butler and Cushman[7, 8, 9] who consider 34 mgm. % an average value for normal controls, but agree well with other workers. Lloyd *et al.*,[21] report 0.0 to 15.4 mgm. % as the range in 89 specimens, and Lubschez[24] found that the majority of children in her study showed a range between 11 to 30 mgm. %. All the acutely damaged cases studied by us showed a low white cell ascorbic acid content one day after admission to hospital and in none of these did the white cell ascorbic acid exceed 20 mgm. % during a period of 15 to 20 days on a high ascorbic acid intake while a rise of 30 to 40 mgm. % occurred in normals within seven days.

These metabolic studies were restricted to well-nourished patients with no clinical symptoms of vitamin deficiency except for case 117 who developed generalized petechiæ four days after injury while on the hospital diet. The selection of patients was necessary to reduce the effect of the patient's diet prior to injury upon the ascorbic acid retention during the metabolic period.

In a saturation test, devised by Harris,[16] a dose of 700 mgm. of ascorbic acid per 140 lb. of body weight resulted in a high ascorbic acid retention for one day in normals and for two to three days in those subjects where the diet had been inadequate in the past. We too have observed in a series of three normal controls an initial high ascorbic acid retention for one to two days when the experimental diet of high ascorbic acid content was introduced. It must be assumed that a similar period would elapse in these patients in order to adapt themselves to the new regimen. Several observed facts, however, suggest that the prolonged high ascorbic acid retention in acutely injured patients is not primarily caused by a previously deficient diet but by the physiological condition of the patient at the time when the metabolic studies were conducted. First, in all our patients, the period of high retention was of longer duration than woud be expected if the patient suffered only a mild nutritional deficiency on admission. This period extended to as much as two weeks in case 119 who retained during this period a total of 3 grams of ascorbic acid. Secondly, in patients in which metabolic studies were begun several months after the acute injury had occurred, (cases 89, 120, and 124), a high ascorbic acid retention of only one to two days, similar to normals, was observed. Finally, the whole blood ascorbic acid content a few hours after admission was compared with a group of twelve normal controls. Values of 0.26 to 0.86 mgm. % were common to both groups. From these blood ascorbic acid studies and from the dietary history and

the clinical picture of these patients, it was felt that these patients did not represent a group of individuals depleted of ascorbic acid prior to admission.

As far as the above evidence goes it indicates that none of the above factors accounts for the marked retention of ascorbic acid after burns and fractures. Thus, there appears to be a rapid and marked destruction or utilization of ascorbic acid during the period immediately following injury. It may be that the metabolic processes after burns or fractures cause a sudden generalized destruction of the vitamin C in the body tissues and that the large amount of ascorbic acid which is required to bring about a rise in the blood ascorbic acid and the urinary excretion merely refills the depleted tissues. Under such conditions, one would expect an increased outpouring of the breakdown products beyond the dehydroascorbic acid stage. Rosenfeld[31] showed that under approximately physiological conditions there is a nonoxidative formation of oxalic acid from dehydroascorbic acid. Whether or not there is any increased excretion of this breakdown product in traumatized patients has not been investigated. Even if those values did not show any significant increase, a rapid complete breakdown of ascorbic acid to carbon dioxide and water cannot be excluded.

There are many physiological functions in which ascorbic acid could be utilized. Ascorbic acid might be built into newly formed tissues and its retention would therefore increase whenever tissue anabolism takes place. However, the striking retention of ascorbic acid occurred in the early stage of damage and is not as marked during the later stage of convalescence when nitrogen metabolism studies indicated tissue anabolism.

The immediate increased requirement of ascorbic acid in damage might be due to the participation of ascorbic acid in cortical hormone synthesis. As early as 1933, Lockwood and Hartman[22, 23] were struck by the similarity of some of the symptoms of adrenal cortical insufficiency and scurvy. In their papers[22, 23] they showed that cortical hormone extracts, free from ascorbic acid, ameliorated some of the symptoms of scurvy, improved the growth curve, and increased the life span of the animals.

Sayer *et al.*,[32] have found that an intraperitoneal injection of adrenotropic hormones resulted in a prompt decrease in the ascorbic acid content of the adrenal, which reached a minimum at one hour of 40% of its original level. The cholesterol content likewise fell, but at a slower rate, reaching a minimum of 50% of its original level at three hours. Within 24 hours, both values returned to normal levels. The marked changes in adrenal cholesterol and ascorbic acid following administration of adrenotropic hormones suggests that those two substances are involved in cortical hormone synthesis.

Investigations on the cortin excretion in acutely damaged individuals are in progress in this laboratory, and indicate that the excretion rises from a normal value of 60 to 80 glycogen units to 200 to 300 glycogen units within a few days after injury and decline after a week or two to normal levels (Venning and Browne).[33] However, no quantitative relationship can be derived from these findings. The cortin excretion, expressed as glycogen units (one unit equals one microgram of compound E) cannot account for several hundred milligrams of the ascorbic acid retained in damage during the same period. It is of interest, however, to note that the period of high cortin excretion (which is believed to be an index of adrenal activity) corresponds with the period of increased ascorbic acid retention. Finally there may be other unknown metabolic processes taking place immediately after injury in which ascorbic acid is utilized.

Although it cannot be decided from the evidence on hand whether the ascorbic acid retained above normal levels in damage is utilized or is destroyed, biochemical data indicate that during the initial period of damage a similar condition exists as is found in individuals on a scorbutic regimen. In the experiment of Crandon *et al.*,[11, 12] when the subject was maintained on a vitamin C free diet, the plasma ascorbic acid fell from 1.0 mgm. % on day 1 to 0.14 mgm. % by day 11. Although our determinations were carried out on whole blood, and are, therefore, not strictly comparable with Crandon's, they indicate a rapid fall in the whole blood ascorbic acid from normal levels to below 0.1 mgm. % within 24 hours following acute damage. In Crandon's experiment, 82 days elapsed before the white

cell ascorbic acid reached 4.0 mgm. %: we frequently encountered such low values as soon as 24 hours after injury. If the low whole blood and white cell ascorbic acid values found after damage are indicative of a state of body depletion, then many of our cases approach scorbutic levels extremely rapidly following acute damage, in spite of the addition of large daily supplements of ascorbic acid to these patients.

While in Crandon's experiment, the vitamin C depletion was caused by a deficient dietary intake, a condition referred to as primary deficiency, the vitamin C depletion in damage may be due to some metabolic process conditioned by the acute injury. There were no obvious symptoms of scurvy in our patients except that one case (case 117) who did not receive any ascorbic acid until day 7 developed generalized petechiæ during the first four days of injury. His previous diet was deficient in vitamin C but no symptoms of ascorbic acid deficiency were noted on admission. We have not investigated whether histological derangement in the wound area similar to that found in scorbutic patients can be encountered in individuals suffering an acute injury with no ascorbic acid supplementation.

Crandon has shown by histological examination that an experimental wound will heal normally in an individual who has been vitamin C depleted for three months. After six months on the vitamin C free diet when the plasma ascorbic acid had been zero for five months, and three weeks after the onset of frank scurvy wound healing still appeared to progress. However, when on the tenth postoperative day a biopsy of the wound was made, it was found that beneath the skin there was no healing of the tissues. Sections of the wound showed a lack of intercellular substance and capillary formation. This experiment demonstrated that wounds can still heal even if no ascorbic acid is present in the plasma but at just what degree of depletion delayed healing begins, we do not know. In our studies the low blood ascorbic acid values were not caused by a deficient dietary intake but were probably the result of a rapid tissue depletion; thus it is conceivable that the onset of delayed wound healing might occur more rapidly in our patients than in Crandon's experiment.

COMMENTS

Our results indicate that the ascorbic acid retention is tremendously increased following damage. Most of our patients received 500 to 700 mgm. ascorbic acid during about six days following damage before saturation was achieved. These doses were of almost the same magnitude as those required after the onset of experimental scurvy to saturate the organism and to permit wound healing. There is, however, no indication from our studies that the high ascorbic acid intake affected the clinical progress of the patient.

The assistance of Dr. M. E. F. Hunter at the beginning of this investigation in organizing the laboratory techniques is gratefully acknowledged; the technical assistance of Miss Janet Alexander, Miss Frances Ingersoll, Mrs. Jane Russell, Miss L. Newman, Miss Janet Slack and Mrs. Anne Hardman is acknowledged.

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BILATERAL FRONTAL LOBE LEUCOTOMY IN THE TREATMENT OF MENTAL DISEASE*

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THIS paper is based on 27 consecutive cases of bilateral frontal lobe leucotomy. It presents a brief historical review, a physiological basis for the operation, the operative technique, and the selection of patients and results.

HISTORICAL REVIEW

Moniz of Portugal[1] was impressed after reading the following description by Jacobsen[2] of the behaviour of a chimpanzee after removal of both frontal areas:

> "The chimpanzee offered the usual friendly greeting, and eagerly ran from its living quarters to the transfer cage, and in turn went promptly to the experimental cage. The usual procedure of baiting the cup and lowering the opaque screen was followed. The chimpanzee did not, however, show its usual excitement, but rather quietly knelt before the cage or walked around. Given an opportunity, it chose between the cups with its customary eagerness and alacrity. However, whenever the animal made a mistake, it showed no emotional disturbance, but quietly awaited the loading of the cup for the next trial. The opaque door was again lowered, but without untoward effect, and if the animal failed again it merely continued to play quietly or to pick over its fur. Thus, while the animal repeatedly failed and made a far greater number of errors than it had previously, it was quite impossible to evoke even a suggestion of an experimental neurosis. It was as if the animal had joined the 'happiness cult of the Elder Micheaux' and had placed its burdens on the Lord."

Egar Moniz published his monograph in 1936, covering the first 20 cases, operated on by Almeida Lima under his direction during 1935 and 1936. The first prefrontal lobe leucotomy in the United States was done by Freeman and Watts[3, 4, 5, 6] in September, 1936, and they published an excellent book on this subject entitled "Psycho-surgery" in 1942. Gradually, following the lead of Freeman and Watts more than 1,000 cases[7, 14] have been done on this continent in many centres. Lyerly,[6] Grant[8] and Love[9] have all reported a dozen or more cases from their respective clinics.

PHYSIOLOGICAL BASIS FOR LEUCOTOMY

Spinal reflexes alone are responsible for most behaviour patterns in the lower vertebrates. As complexity develops, there is need for control of these reflexes and co-ordination of them with cranial afferents (smell, hearing, sight etc.), thus the basal ganglia develop and in most pre-mammalian forms represent the large part of the brain. Here simple memory patterns are stored and reflexes are co-ordinated. Functions having to do with survival, such as feeding, migration, mating, heat and body fluid regulation, sugar and fat metabolism, are implemented in these basal ganglia. In whole or in part these functions are retained in these basal ganglia in the higher vertebrates and primates and the human brain. In these higher forms the increasing complexity of reflexes has necessitated a still further development of the brain, namely the cortex and its white matter. The nervous system comes under the control, in part or in whole, of this superadded cell structure with its mass of association fibres.

Fig. 1 indicates the important sensory impulses from skin, joints, muscles, eyes and ears which are relayed to the cortex. These impulses are analyzed and stored in the cortex adjacent to the special cortical reception areas. There is thus an anatomical explanation for the fact that the human without his frontal lobes is capable of describing in detail an object which he sees, hears and feels, etc., *e.g.*, a tree has leaves, bark, branches, the leaves rustle and the bark is rough, cold and has a certain texture. Incoming impulses may be stored for future use or immediately result in out-going impulses such as motor action or speech.

All this is possible without the frontal lobes, the last portion of the cortex to be developed phylogenetically and reaching its highest development in the human.

It is with the frontal lobes that we are especially concerned in the operation of frontal lobe leucotomy, a procedure which divides many association fibres in the white matter of these lobes. In the human mind there is no obvious intellectual defect following the removal of either frontal lobe. When both lobes are removed, the individual shows a marked change (Brickner[10]). This change can be compared to the inebriate state without ataxia. The individual becomes boastful, careless and lacks judgment. He lacks initiative and is incapable of planning and cannot grasp complicated problems. Such an individual could operate a simple boat. He would require his

* Read at the Seventy-seventh Annual Meeting of the Canadian Medical Association, Section of Psychiatry, Banff, Alberta, June 12, 1946.

frontal lobes, however, to be taught anything more than the rudiments of sailing. He would require his frontal lobes to appreciate the danger of a storm and plan appropriate action. Such complicated thinking, where one idea follows another logically, has been termed by the psychiatrist, synthesis. The reaction following such thinking is governed by judgment. Synthesis and judgment are both conditioned by knowledge learned in the past (experience), and further conditioned by emotional tone (mood).

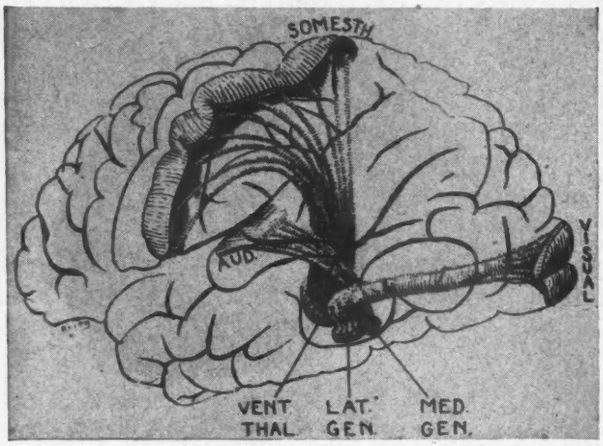
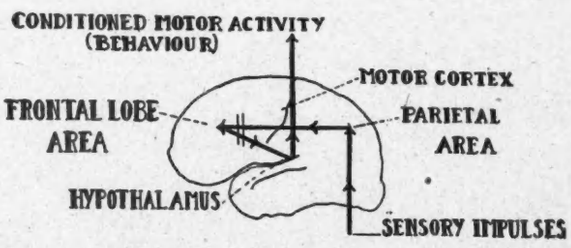


Fig. 1.—From *Functional Anatomy* by Kreig, showing the sensory tracts within the brain for impulses from skin, joints, muscles, eyes and ears to the cortex.

We are aware that all behaviour is conditioned by emotional tone. It has been shown that there are basal centres (hypothalamus) which, in the animal deprived of his frontal lobes, can produce on stimulation a state of fear to the point of protective combat.[12] However, such emotional tone is a primitive survival mechanism and does not allow the fine judgment that is required in our complex social life. This primitive reaction is conditioned by centres in the frontal lobes, and if we consider the reflex-like arcs involving association tracts from the sensory cortical areas of the thalamus and hypothalamus, and from the frontal cortex to the thalamus and hypothalamus, we are able to postulate the dynamics of the production of emotional tone. If the hypothalamus is over-active to impulses received from the frontal cortex and thalamus, so as to be stimulated and produce a state of fear, we would expect to find an emotionally unstable, fearful individual whose complex delicate mental processes are distorted by this abnormal emotional tone. On this basis, the breaking of these so-called reflex arcs should bring about at least a partial reduction of the stimulation that was affecting the hypothalamic centres and the patient's fear should be reduced. If a complete break occurs, euphoria may result. We know that removal of both frontal lobes abolishes fear.[10] Inasmuch as the neuro-surgical procedure involves a very small incision in the cortex, little impairment would be expected in the other complex functions in this part of the brain (intellect, judgment, synthesis etc.) and as the incision involves approximately 3/5 of the association tracts between the frontal cortex, thalamus and hypothalamus, there still remains a limited connection to permit the conditioning of our emotional tone and thus our behaviour, by the frontal cortical areas and thalamus.

Fig. 2, in the top portion, shows schematically the inter-relationship of the various components conditioning our behaviour and it will be seen that incoming sensory impulses are conditioned by thought and feeling, which together allow what we term adaptation, and determine our behaviour or expression. Fig. 2, in the lower

FIG. 2



portion, shows schematically the comparable neuro-anatomical pathways involved in the conditioning of our behaviour or expression. The sensory impulses are received in the parietal areas, from there relayed to the thalamus which in turn has association fibres to the frontal lobe[11] and hypothalamus, the hypothalamus in addition having association tracts directly from the frontal lobe. Thus, thought, centred in the frontal lobe areas, and feeling, the result of impulses implemented in the thalamus and hypo-

thalamus, are brought together through the association tracts connecting these three areas and determine our behaviour (motor activity) emanating from the pre-Rolandic areas.

Fig. 3 shows the important fronto-thalamic tract in the inferior portion of the frontal lobe. It will be obvious, as this paper is presented, that what has been set forth above as the possible

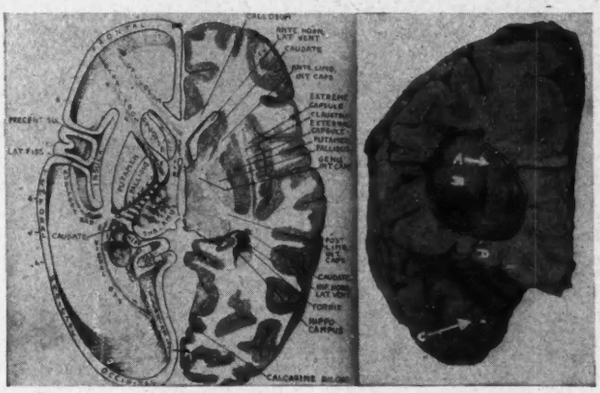


Fig. 3 Fig. 4

Fig. 3.—From *Functional Anatomy* by Kreig, showing the important fronto-thalamic tract in the inferior portion of the frontal lobe. [By permission of the author]. **Fig. 4.**—Cadaver dissection to illustrate the cut in the white matter of the frontal lobe. (A) Track of brain needle and special cutting instrument. (B) Dissection to show cut in white matter of frontal lobe. (C) Tip of temporal lobe. (D) Orbital surface of frontal lobe.

results of this leucotomy, has been demonstrated clinically in the vast majority of patients subjected to the operation. In fact no other demonstrable psychiatric change has been observed as a constant result, other than reduction in the patient's state of fear.

The technique of the destruction of these tracts is such that we do not suggest the exact pathways that have been severed, but are certain that approximately 3/5 of the various association pathways between the frontal cortex and thalamus and hypothalamus are involved in the leucotomy (Fig. 4). The afferent pathways passing into the hypothalamus that are concerned in this incision are the fronto-septal, septo-hypothalamic and thalamo-hypothalamic pathways (Fulton).[13] These tracts are situated in the inferior portion of the white matter of the frontal lobes.

Our interest in bilateral frontal lobe leucotomy was stimulated by Freeman and Watts, and in 1939 we visited Washington and were kindly shown a number of their cases. In 1941 the research unit of the Toronto Psychiatric Hospital embarked upon the psycho-surgical treatment of hopelessly mentally ill patients. The first patient chosen was a mentally defective female, aged 58, suffering from an involutional agitated depressive state with paranoid features. She had been ill for 2 years previous to the operation, having had a remission of five years' duration from a prior mental illness. At the time of operation, she continually described "little men" who were hammering at her brain and slowly killing her and because of this she felt she would be better dead. There were bouts of weeping and an undercurrent of anxiety which resulted in her pacing about the ward constantly, obviously fearful of what was going to happen. She found it progressively difficult to attend to her toilet habits and she was agitated to the point where she had no appetite. She had lost weight over the period of her illness and at the time of operation her weight was 92 lb. Following a bilateral frontal lobe leucotomy there was an immediate disappearance of her delusions and no discussion in regard to her previous anxiety unless it was initiated by the examiner. At the end of two months she had gained approximately 15 lb. in weight. She now was able to help in the care of convalescing patients in a boarding-out home, being limited only by her mental deficiency. In view of this remarkable improvement, 26 patients were subjected to this treatment during the next 5 years.

In the selection of cases, from a psychiatric standpoint, the criterion employed required at least "pathological fear" in the clinical picture. This fear was manifested by anxiety, agitation or impulsive behaviour.

In a number of the patients, insulin shock therapy, as the treatment for schizophrenia, with electroshock therapy as the treatment for catatonic schizophrenia and specifically in depressed mental states, had failed to bring about a maintained improvement. All patients had been ill for more than 2 years with little hope for any significant improvement at any time in the future.

OPERATIVE TECHNIQUE

Preoperative investigation.—In the preoperative investigation, particular attention was paid to the cardiovascular system. A complete cardiological examination was performed by a competent cardiologist and the only contra-indication to the operation was a cardiovascular system that was abnormal, due consideration being given to the age of the patient. Such routine investigations as blood examination, renal and liver function tests and car-

bohydrate metabolism tests, etc. were fully considered. Investigation was made into the effect of the operation on glucose tolerance and electrocortical activity (electroencephalography), but time does not permit discussion of these features of the research project.

Intra-tracheal ether was used as most patients were difficult to handle and local anæsthesia would have been quite inadequate.

Operation.—The patient is placed in a semi-sitting position with the head in a crutch head rest. Scalp incisions are carefully marked out before draping to give exposure of the superior aspect of the frontal lobe just in front of the estimated anterior tip of the lateral ventricle; a pair of burr holes 1½" apart are made on each side (Fig. 5). The upper burr hole on each side is placed about ¾" from the midline, the lower about 1½" from the upper. The intervening blocks of bone are removed on each side. The dura is opened and an avascular convolution selected. Brain needles are passed down to the posterior margin of the mid-portion of the orbital plates. As the assistant removes a brain needle a special instrument, (Fig. 6), is passed through the frontal lobe to the orbital plate. The instrument is then opened, closed, rotated and again opened, then closed and withdrawn (Figs. 7 and 8). This procedure is repeated on the other side. The dura is closed, the block of bone and burr hole bone dust replaced. The scalp is closed with a double layer of fine silk.

This technique differs from that employed by Freeman and Watts in that our approach is from above rather than the side, this along with the special instrument appeals to us as a more accurate and safer method than the

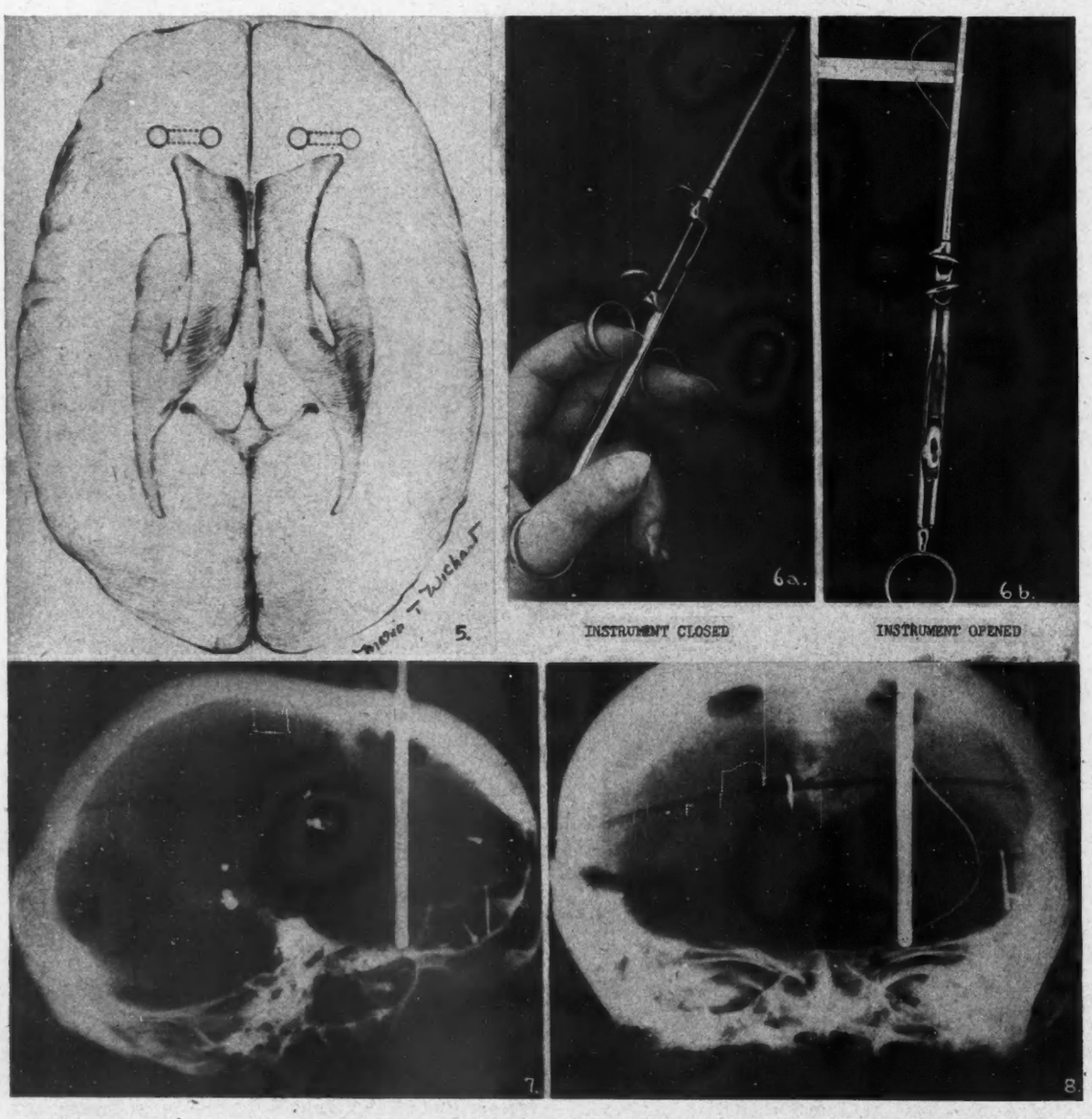


Fig. 5.—Showing the approximate position of the burr holes in relation to the anterior tips of the lateral ventricles. **Fig. 6.**—Showing the special instrument for performing the leucotomy. **Fig. 7.**—Showing the special instrument in position. **Fig. 8.**—Showing the special instrument open; thus having completed one-half of the cut in one lobe. The instrument is closed, rotated and the cut then completed on one side. The procedure is then repeated on the other side.

lateral approach. There is a minimum of cortical injury, none of our patients has developed epilepsy, and no serious hæmorrhage has been produced.

Postoperative course.—There have been no operative deaths. All wounds healed by first intention, and because of the replacement of bone dust, did not sink in at a later date. The patient usually was able to take solid food within twelve hours and sit out of bed within seventy-two hours. Rapport improves within the first week but it may be a month before the improvement is such that energetic psychotherapy is possible. The outstanding feature in the postsurgical psychiatric care is to determine discreetly the emotional tone attached to the basic etiological agents which previously produced anxiety. When this is determined, the patient's previous psychiatric problems can be discussed in completeness and the patient made aware of the fact that their previous attitude towards these etiological agents was at least grossly exaggerated, and reassurance given that as long as this understanding is properly maintained, the problem will not return.

The remainder of the postsurgical psychiatric care consists of the re-establishment of the patient in society, either returning to his household or other employment. As soon as rapport has been established, the social service nurse (who obtained the social history) establishes contact with the patient in order that follow-up visits or inquiries can be made at three or six monthly intervals without undue concern to the patient. When the patient is able to use his hands, simple occupational therapy is commenced and increased in complexity throughout his stay in hospital.

Complications.—The most serious complication following bilateral frontal lobe leucotomy is cerebral hæmorrhage, but fortunately this complication has not occurred in this group. There have been no obvious neurological abnormalities as a result of the procedure, and the only complication, if it might be called such, has been hypersexuality noticed in 25% of our cases. This difficulty is often seen in neoplasms or other lesions involving the frontal lobes. The complication has not presented a serious feature as it has been manifested by either unusual demands upon the marital partner, or increased masturbation. No anti-social sexual behaviour has been reported, referable to the complication, in our series of patients. Usually the increased libido persists for nine to eighteen months, gradually returning to normal. Patients gain from 15 to 50 lb. during the six months following the operation.

Results.—In Table I is shown the present status of the various patients on whom this operation has been performed. On analyzing our results, the outstanding fact is that those patients in whom anxiety was the predominant psychiatric abnormality, showed the greatest degree of improvement and the longest maintenance of their improvement. In the affective group 64% (9 of 14 cases) recovered, allowing their discharge from a mental hospital, and 22% (3 of 14 cases) improved so that the nurs-

TABLE I.

RESULTS OF BILATERAL FRONTAL LOBE LEUCOTOMY

Diagnosis	*No. of cases*	*Average duration of illness*	*Results**			*Percentage improved or recovered*
			Failures	*Improvements*	*Recoveries*	
Affective disorders:						
Manic depressive (depressed)	3	3 years	0	0	3	
Involutional melancholia	10	4 years	2	2	6	
Schizo-affective (depressive features)	1	20 years	0	1	0	
	14		2 (14%)	3 (22%)	9 (64%)	86%
Schizophrenia:						
Catatonic type	6	4 years	1	3	2	
Paranoid type	2	5 years	0	1	1	
Unclassified	4	6 years	1	3	0	
	12		2 (17%)	7 (58%)	3 (25%)	83%
Psychoneurosis:						
Anxiety state	1	3 years	0	0	1 (100%)	100%
	27		4 (15%)	10 (37%)	13 (48%)	85%

Complications—Mild hypersexuality—7 cases (3 female, 4 male) (25%).

* Recovery indicates ability to carry on independently outside of mental hospital.

TABLE II.

SYNOPSIS OF CASES SUBJECTED TO BILATERAL FRONTAL LOBE LEUCOTOMY

Patient	*Age*	*Diagnosis*	*Duration of illness*	*Preoperative mental state*	*Time since operation*	*Present mental state*
1. E.,F. (F.).....	51	Manic depressive psychosis (depressed features)	6 years	Depressed, untidy and fearful.	19 mos.	Complete recovery.
2. DeL.,J. (F.)...	54	Manic depressive psychosis (agitated phase)	4 years	Extremely agitated and fearful.	36 mos.	Complete recovery.
3. H.,G. (F.).....	54	Manic depressive psychosis (depressed phase)	2 years	Depressed, agitated and fearful. Inaccessible.	43 mos.	Improved. Able to be with family. Seclusive, definite psychomotor inertia.
4. W.,J. (F.).....	58	Involutional melancholia (paranoid features)	2 years	Fearful because of paranoid hallucinations.	48 mos.	Improved. Able to help in boarding home until appearance of carcinomatosis. Died 2½ years following operation for carcinoma of breast.
5. F.,T. (M.)....	64	Involutional melancholia	3 years	Depressed with periods of agitation.	54 mos.	Improved. Able to be home but childish behaviour now suggests senile mental changes.
6. O.,L. (F.).....	55	Involutional melancholia	5 years	Agitated, resistive, and fearful.	25 mos.	Complete recovery.
7. F.,D. (F.).....	57	Involutional melancholia	6 years	Extremely agitated, fearful and resistive.	31 mos.	Recovery. Able to manage household but shows emotional instability that may be constitutional.
8. G.,J. (M.).....	60	Involutional melancholia	3 years	Agitated, ill kempt, hallucinated.	42 mos.	Unchanged.
9. H.,M. (F.)....	51	Involutional melancholia	4 years	Agitated, ill kempt, impulsive, showing flight of ideas and copramania.	36 mos.	Unchanged.
10. C.,M. (F.)....	60	Involutional melancholia	8 years	Extremely agitated, almost to the point of physical exhaustion. Inaccessible.	12 mos.	Improved for 9 mos. then physical state deteriorated and mentally patient relapsed. Died of chronic myocarditis.
11. G.,J.J. (M.)...	69	Involutional melancholia	5 years	Irritable at times apathetic with marked psychomotor inertia. Physically deteriorated.	41 mos.	Improved for 2 yrs. remained somewhat cantankerous and signs of senile mental changes appeared.
12. P.,A. (F.).....	60	Involutional melancholia	2 years	Obsessed with idea of sin; agitated, untidy with bouts of weeping.	4 mos.	Complete recovery.
13. A.,E. (F.).....	60	Involutional melancholia	5 years	Extremely anxious, to the point of agitation. Hypochondriacal and fearful.	38 mos.	Improved.
14. J.,A. (M.).....	52	Schizo-affective	20 years	Periods of manic behaviour alternated with periods of marked psychomotor inertia, when patient was completely inaccessible.	37 mos.	Improved for 1 yr. when able to be on working parties but relapsed and now agitated, hallucinated and untidy.
15. B.,R. (F.).....	31	Schizophrenia (Catatonic type)	4 years	Agitated, hallucinated and impulsive.	42 mos.	Recovered, only mental abnormality is facetious, superficial behaviour.

Patient	*Age*	*Diagnosis*	*Duration of illness*	*Pre-operative mental state*	*Time since operation*	*Present mental state*
16. H.,R. (M.)....	23	Schizophrenia (Catatonic type)	4 years	Catatonic with periods of agitation and possible depressive features.	50 mos.	Improved. Able to be out of hospital but still immature, superficial behaviour and requires continual supervision by family.
17. V.,A. (M.)....	35	Schizophrenia (Catatonic type)	9 years	Mute catatonic, destructive and impulsive.	30 mos.	Improved for sporadic intervals during first six months, able to work around hospital grounds then relapsed to former mental state.
18. A.,G. (M.)....	23	Schizophrenia (Catatonic type)	2 years	Impulsive, periods of acute catatonia. Mute, resistive, personal habits filthy.	52 mos.	Improved. Has had 2 short relapses requiring mental hospital care. At present at home, but unable to hold a job for longer than several months at a time. Wanders from home, spends money foolishly.
19. I.,B. (M.).....	21	Schizophrenia (Catatonic type)	5 years	Seclusive, marked psychomotor inertia, posturing, etc.	53 mos.	Unchanged.
20. R.,S. (M.)....	46	Schizophrenia (Catatonic type)	7 years	Extremely fearful because of imaginary people who planned to harm him. Seclusive, with marked psychomotor inertia.	1 mos.	Improved. Able to return home on probation, is slightly euphoric but no longer fearful.
21. K.,A. (M.)....	36	Schizophrenia (Paranoid type)	5 years	Agitated, untidy, violent, seclusive, apathetic.	47 mos.	Complete recovery.
22. J.,A. (F.).....	39	Schizophrenia (Paranoid type)	5 years	Unco-operative, resistive, negativistic with paranoid delusions and hallucinations.	47 mos.	For 3 yrs. co-operative, tidy, contented, then relapsed; now inaccessible, talks in meaningless fashion, hallucinated.
23. G.,E. (M.)....	32	Schizophrenia (Unclassified type)	12 years	Impulsive, disoriented, fearful, hallucinated, untidy, incoherent.	12 mos.	Improved. Able to be home, shows interest in occupational therapy, sports and personal appearance. Still superficial and unable to get along without 24 hour supervision by family.
24. P.,J. (F.).....	21	Schizophrenia (Unclassified type)	3 years	Silly, superficial behaviour, hallucinated, impulsive, unco-operative.	8 mos.	Improved. Able to live with family; silly behaviour still present; no further impulsiveness.
25. B.,J. (M.).....	22	Schizophrenia (Unclassified type)	3 years	Sullen, periods of marked psychomotor inertia, untidy, grandiose ideas.	12 mos.	Improved for 6 mos., able to study Sr. Matriculation subjects. Then relapsed for 3 mos. Past 3 mos. improved, able to be with family on farm. Unable to adapt to group activity.
26. H.,D. (M.)....	36	Schizophrenia (Unclassified type)	5 years	Psychomotor inertia, delusions as to sin, agitation, periods of apathy, suicidal tendencies.	14 mos.	Unchanged.
27. Q.,F. (F.).....	53	Psychoneurosis (Anxiety state)	3 years	Fearful and restless.	6 mos.	Complete recovery.

ing problem was significantly decreased. A total of 85% (12 of 14 cases) in this group therefore benefited from this therapeutic procedure. In the schizophrenic group, 25% (3 of 12 cases) recovered and were discharged from hospital and 58% (7 of 12 cases) were improved nursing problems. It is obvious, therefore, that the improvement in this group was not as complete as in the affective disorders. It is of interest to note that approximately the same percentage, 86% in the schizophrenic group, showed a significant improvement in behaviour following operation, but the percentage discharged from hospital differed widely in the two groups (64% in the affective as compared to 25% in the schizophrenic). In the one case of psychoneurosis, an anxiety state, a complete recovery was made and has been maintained for the past seven months. The two failures in the affective group were cases of involutional melancholia in whom obvious mental deterioration had taken place. In the schizophrenic group, one failure was a case of catatonic schizophrenia with obvious mental deterioration. The patients in whom mental deterioration was apparent, as manifested by reversion to primitive types of behaviour, were automatically excluded from the series, following failures in three such cases. The remaining failure, a case of schizophrenia of the unclassified type, could not be attributed to deterioration. The series consisted of 14 females and 13 males whose ages ranged from 21 to 69 years.

Table II is a case synopsis of our series. It is noteworthy that in this small series of 27 cases, assuming that the average life of a patient would be 65 years and that the patient would require mental hospital care for the remainder of his life, this neuro-surgical procedure has saved an expenditure of approximately $70,000 (calculated on a basis of 230 hospital years at $300 per year). This saving could be increased many fold if facilities were available to select suitable candidates and to provide medical, surgical and nursing care for this procedure.

PSYCHOLOGICAL TESTS

Approximately 20 of the patients in our series were subjected to the following battery of psychometric tests before and after leucotomy: Kent-Rosanoff word association test; Healy pictorial completion test; progressive matrices; Stanford-Binet or Wechsler-Bellevue; orientation-memory test; attitude scale.

By this means, some of the complex functions of the cerebral cortex could be evaluated, but in the majority of cases such evaluation was only possible following the operation, as preoperatively the patient was inaccessible. We can state that by the above tests there was no significant gross defect in the patient's intelligence following the operation but orientation and memory were impaired slightly for a period varying from several weeks to several months postoperatively. We feel there is a real need for the development of better means of testing a patient's capabilities before and after operation as we appreciate the limitations of our above tests. Halstead[7] has reported at the 1946 convention of the American Psychiatric Association, a method by which better assessment can be made of the patient's capabilities following bilateral frontal lobe leucotomy. Further observations will take place in this regard as our series increases.

SUMMARY AND CONCLUSIONS

We have presented a series of 27 cases in which there has been a mental illness lasting for more than an average of 3 years and in which all other recognized psychiatric therapies were employed to no avail. A common clinical finding in this series was that of fear, agitation or impulsive behaviour. In the combined group, approximately 85% of the cases have shown improvement ranging from improved nursing problems to complete recoveries. Thirteen of 27 patients, who were previously considered to be hopelessly mentally ill, have been returned to community life. The only complication observed is that of a mild hypersexuality in 25% of the cases. In our opinion, this neuro-surgical procedure offers a valuable addition to our therapeutic armamentarium in the treatment of what previously would have been considered hopelessly mentally ill patients.

The investigation reported in this paper was in part supported by grants from the Rockefeller Research Foundation and was carried out in the department of psychiatry of the University of Toronto. The nursing and hospital facilities were made available by the Department of Health, Province of Ontario. The authors are deeply indebted to Professor C. B. Farrar for his assistance and direction in this project. We wish to express our appreciation of the co-operation of the superintendents of the various Ontario Mental Hospitals from which patients were made available for this treatment, to the Toronto General Hospital for providing facilities for the neuro-surgical procedure and to the Toronto Western Hospital for providing private ac-

commodation for patients of that category. Miss Helen Algie, R.N. has been of great assistance in the collection of follow-up data.

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CANCER OF THE PROSTATE*

(An Eleven Year Survey at the Toronto General Hospital)

By Robin Pearse, F.R.C.S. and Ernest G. Meyer, M.D., M.S.

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CARCINOMA of the prostate usually arises in the posterior lobe of the gland, well away from the urethra (Fig. 1). For this reason, in the early stages of the disease there are no symptoms. The growth, however, may be readily felt by palpation through the rectum.

A patient with cancer of the prostate can be cured by total prostatectomy in the early symptomless stages, while the tumour is still within the capsule of the gland, provided there are no metastases. If the growth has spread beyond the confines of the prostate, the patient is incurable by any known method of treatment.

Since the disease in this early stage has no symptoms, it can only be found by routine examination. It is, therefore, imperative that a careful rectal examination be made on every male over fifty years of age who presents himself for routine "health examination" or "annual overhaul". It is important that every medical man be familiar with the "feel" of early prostatic cancer. A small hard nodule with ill defined margins felt in the prostate on palpation per rectum should be regarded with grave suspicion. The nodule may be either an early cancer, a fibrous nodule resulting from chronic prostatitis, or a pocket filled with small calculi.

Chronic prostatitis, which has undergone fibrosis, produces a gland which feels granular rather than nodular, and nodes produced by calculi tend to be sharper and better defined than cancerous nodules.

It is often difficult to make a decision on one examination. For this reason it is wise to have the patient return in a couple of weeks and, if one cannot convince oneself that the node is definitely not a carcinoma, the problem should be explained to the patient, he should be admitted to hospital (serum acid and alkaline

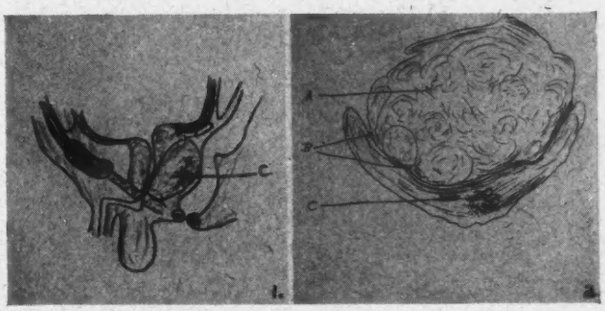


Fig. 1.—Diagram showing site of early cancer, adjacent to rectum remote from urethra. **Fig. 2.**—Diagram showing "A" adenomyoma. "C" nodule of cancer in thinned-out prostate gland. "B" line of cleavage followed by the finger when suprapubic enucleation is done.

phosphatase estimated), and prepared for perineal prostatectomy. The gland is then exposed by the perineal route. The nodule is excised without opening the urethra, and a fresh biopsy done. Should the report be negative, the incision is closed and the patient leaves hospital in a week. If the sections show cancer cells, one proceeds with a radical prostatovesiculectomy, with good prospects of curing the patient.

Early symptomless, curable cancer of the prostate may accompany an adenomyomatous enlargement of the gland which is causing some frequency and difficulty. Unfortunately,

* Read at the Seventy-seventh Annual Meeting of the Canadian Medical Association, Section of Urology, Banff, Alberta, June 12, 1946.

the popular fallacy that it is normal for a man "getting on in years" to have to get up at night to urinate, delays the time when the patient seeks advice, until the cancer itself is beyond removal. The nodule is felt on rectal examination between the adenomyoma and the rectal wall.

It is important to realize that the cancer is not in the adenomyoma, but in the thinned-out prostate, which forms the so-called false capsule of the larger (benign) tumour, and will not be removed by the operation of suprapubic enucleation, which is commonly but erroneously called prostatectomy. Fig. 2 illustrates what is achieved by this procedure. The patient will get a satisfactory immediate result, but the residual carcinoma will progress to an inoperable stage in an average of three or four years.

Obviously, such a case, if the nodule is small, should be treated by a perineal operation, the suspicious nodule sectioned and then either enucleation of the adenomyoma or total prostatectomy proceeded with according to the pathologist's report.

Unfortunately, the majority of patients come for treatment in the later stages of the disease with either symptoms from obstruction or metastases or both. There is no known cure for such a patient. However, bio-chemical research has provided treatment which will, in the majority of cases, for a limited time retard the progress of the disease and relieve the pain of metastasis to bone.

Various phosphatases are present in the blood and other body tissues, but the adult prostate of man and monkeys is extraordinarily rich in a phosphatase having an optimum activity at a pH of 2.5, which originates in the acinar epithelium of the gland.

This "acid" phosphatase is present in large quantity in carcinoma of the prostate (unless the carcinoma be of the undifferentiated type), both in the local and metastatic tumours. The enzyme escapes from the tumour into the lymph and blood channels, thereby raising the "acid" phosphatase of blood serum.

The normal range of "acid" phosphatase in the serum is the same in men and women, 0.5 to 2.5 King Armstrong units per 100 c.c. of serum. It is elaborated mainly in the kidney, spleen and liver. There is also a phosphatase in the red blood corpuscles, having a maximum activity at pH 6.0, but retaining some activity at lower levels, therefore, a reading from serum where some hæmolysis has taken place may be misleading.

Gutman and Gutman found the acid phosphatase level normal in over 90% of 853 men who had no apparent prostatic disease. It was normal in 100% of 75 men suffering from adenomyoma of the prostate, and normal in 90% of 70 patients who had carcinoma of the gland without demonstrable metastases. The serum acid phosphatase was raised in 85% of 177 cases of carcinoma of the prostate with metastases.

With these facts in mind Huggins theorized as follows: Immature prostatic cells contain negligible amounts of enzyme, adult prostatic epithelium contains a large amount, cancerous cells of prostatic origin also contain a large amount of enzyme. We know that normal mature prostatic epithelium can be made to atrophy by reducing the amount or neutralizing the effect of androgenic hormone in the body. Perhaps it is possible to produce atrophy of malignant prostatic epithelium by castration or administration of œstrogens (Gutman).

Since 1941 when Huggins and his associates published their first clinical results, a vast number of patients have been treated in many clinics with varying success. The reason for failure in some cases is obvious, the carcinoma is found to be undifferentiated, it is not the same biological entity as the common type of prostatic cancer, and therefore cannot be expected to react in the same way to the same physiological stimulus.

The result following bilateral orchidectomy on a patient with obstruction and pain from metastases is very striking. In twenty-four to thirty-six hours the pain has gone, in a week or so the patient is voiding more freely. Occasionally a patient with previous complete retention will void down to a residual of three or four ounces. X-ray examination of the osseous metastases will show a return to more normal bone structure in two to three months.

The serum acid phosphatase shows an immediate drop towards normal level, and the alkaline phosphatase (pH 9.0) shows an initial further rise and then a slower recession.

The relief from adverse symptoms is more marked as regards the metastases than the local tumour. Many cases require transurethral re-

section in spite of orchidectomy. It is, however, good practice to do the orchidectomy first and carry the patient along with the aid of an indwelling catheter for a week or ten days until the cachexia is under control and the patient better able to withstand the more major operation.

The same chain of events may occur when a similar patient is put on stilbœstrol, but with either treatment the results may be much less striking. Only of one thing can we be sure, namely that the disease will sooner or later reactivate and claim its victim. No man has ever been cured by this treatment. Patients who run a long course before relapse have been aptly termed by Herger and Sauer[2] "delayed failures", and these authors have noted that "the phosphatase does not climb again in proportion to the progress of the disease". Laboratory results must, therefore, be discounted by clinical findings.

Why these patients relapse is not known. Perhaps a second endocrine substance is needed to enhance the action of an intermediary gland.

Androgens are produced in the testes and adrenals. Possibly after orchidectomy the adrenals acquire a compensatory androgen activity, thereby reactivating the cancer. In this case combined treatment by orchidectomy and stilbœstrol should achieve better results than either one alone. Experience does not support this conjecture. In reviewing personal cases we are more struck by the bizarre results obtained than by any uniformity in the reaction of the disease in patients submitted to the same treatment. Judgment is apt to be influenced by a few good results in personal cases, hence one clinician will advocate immediate orchidectomy, and another will say no, give stilbœstrol first and when the relapse occurs you still have orchidectomy to fall back on. The argument either way is thin. More androgen and œstrogen research in the male is needed.

Since the epididymis is not concerned in the production of androgens, it is only necessary to remove the bodies of both testes, replacing the cords and epididymis in the scrotum. This operation can be done through a one inch incision over each external inguinal ring. The presence of something in the scrotum pleases the patient; of course the epididymis atrophies in three or four months, but by that time the patient is reconciled.

The dosage of stilbœstrol is empirical, and it would seem to us reasonable to base it on physiological reaction. Our practice is to give two milligrams three times daily by mouth, and reduce the dose only if the breasts become excessively sore. We have seen patients with pain unrelieved by two milligrams per day obtain relief when the dose was increased. One patient, who had no relief with a daily dose of six milligrams of stilbœstrol by mouth, obtained relief by the addition of two milligrams of diethylstilbœstrol diproprionate by hypodermic each day for ten days, after which the six milligrams of stilbœstrol per day by mouth controlled the pain for several months.

Some patients are nauseated or depressed by stilbœstrol, and the drug should be changed to diethylstilbœstrol diproprionate. There are one or two more synthetic œstrogens on the market of which we have had no personal experience.

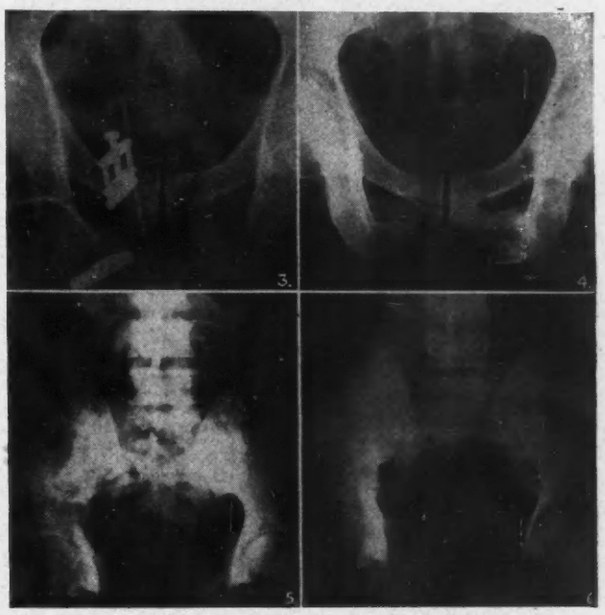


Fig. 3.—X-ray film showing almost total destruction of the left ascending pubic ramus, secondary to carcinoma of the prostate. **Fig. 4.**—Repeat film one year later showing regeneration of the bone following stilbœstrol therapy. **Fig. 5.**—Film showing extensive involvement of lumbar vertebræ and pelvic girdle. **Fig. 6.**—Repeat film one year after bilateral subtotal orchidectomy.

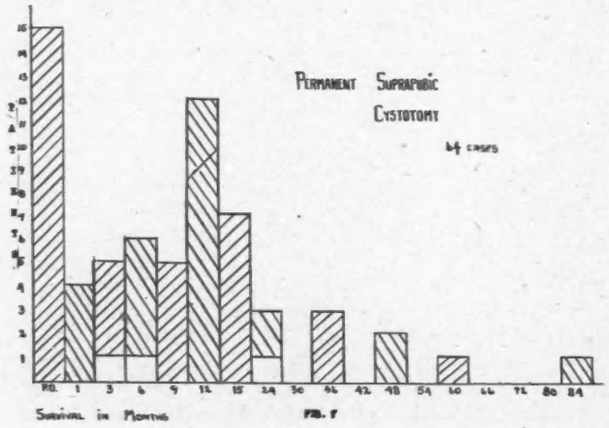
The value of any particular treatment for an incurable disease should be considered from two points of view. First, does it render the patient less miserable? Second, will it prolong his life? Œstrogen therapy does both with the emphasis on the first consideration. It must, however, be remembered that some cases live from four to ten years without any treatment. Metastases

are not a factor in these patients. They die from uræmia due to obstruction of the intramural portion of the ureters following invasion of the floor of the bladder by direct extension of the growth. Intestinal obstruction may also occur from spread of the carcinoma along the rectovesical layer of the pelvic fascia.

At the Toronto General Hospital during the years 1935 to 1945 inclusive, 310 patients with carcinoma of the prostate were submitted to various operative procedures with the results shown on the accompanying graphs. Any patient, who did not survive for four weeks, has been called a postoperative death.

Series 1. Permanent suprapubic cystotomy: 64 patients, roughly 23%, died in the first month, 45% survived one year, but only 15% survived two years. One patient lived seven years.

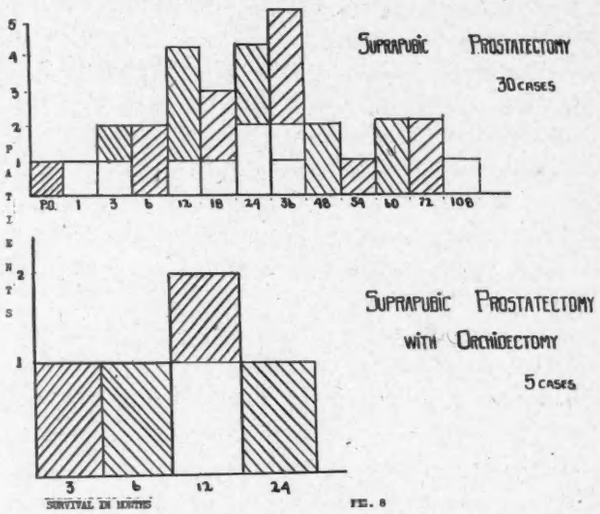
This operation is rarely done now. The tube requires at least daily irrigation, preferably with half strength "G" solution to deter infection with urea-splitting organisms, which renders the urine alkaline and accelerates plugging of the channel with urinary salts, making frequent changing necessary.



Series 2. Partial suprapubic prostatectomy: 35 patients, one died in the first month, 77% survived one year, 51% two years, 37% three years, 23% four years, and one patient is still alive, taking stilbœstrol at nine years. Five patients in this series also had orchidectomy performed; only one of these five survived two years.

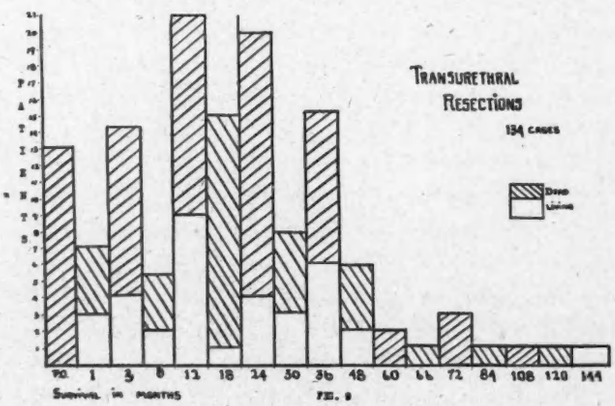
Patients in this group were in better physical condition at the time of operation than those in series 1, hence the lengthened survival. The operation is not recommended. Transurethral resection gives as good functional results with less risk.

Series 3. Transurethral resection: 134 patients, 13 died in the first month, 70% survived one year, 44% two years, 23% three years, 12% four years, six patients for six and one patient for twelve years. Many of these patients were in poor physical condition at the time of operation.



Series 4. Transurethral resection and orchidectomy: 38 patients, 2 died in the first month, 70% survived one year, 50% two years, 34% four years, and one patient is still alive at nine years.

Series 5. Orchidectomy only: 20 patients, 2 died in one month, 60% survived one year, 30% two years. Three patients survived three years



and two, of whom one is still living, survived four years. Most of these patients had considerable pain from metastases and little or no urinary obstruction.

Series 6. Perineal subtotal prostatectomy: 7 patients, 3 died in the first month, 4 survived one year, 3 for eighteen months and two patients, one of whom is still alive, survived four years. This latter patient also had orchidectomy.

Series 7. Perineal total prostato-vesiculectomy: 12 patients. The first death occurred at six months, 7 patients survived one year, 4 patients three years and 3, of whom one is still alive, four years. One of the year survivals, now dead, had also orchidectomy.

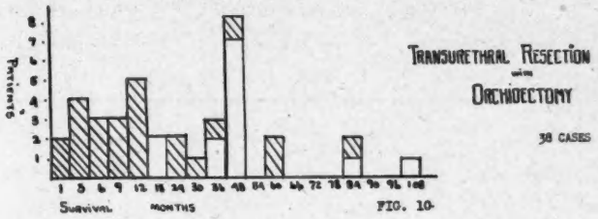


FIG. 10.

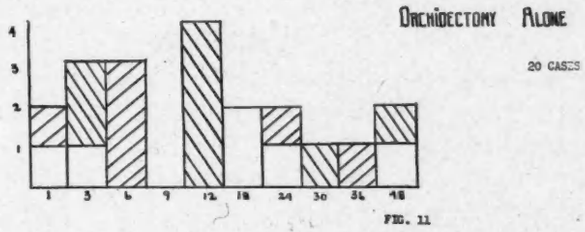


FIG. 11.

Two patients, who are apparently free from disease, were operated upon in the past three months. Only recently has more than an occasional case come early enough to perform complete excision. The histological sections show that some of the cases in this series should be among the subtotals.

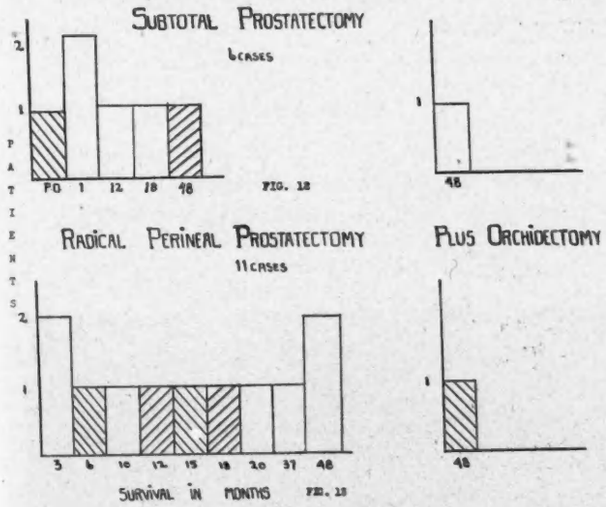


FIG. 12.

FIG. 13.

CONCLUSIONS

The prostate ranks third in frequency as the site of cancer in the male, being surpassed only by the skin and gastro-intestinal tract. Cancer of the prostate is an insidious disease with no symptoms in the curable stages. It must be searched for by routine examination, aided if necessary by perineal biopsy. There is a reasonable hope of curing early cases by perineal prostato-vesiculectomy. In advanced cases œstrogen therapy is at present the best palliative treatment. When obstruction is a factor, transurethral resection should be done. Whether orchidectomy is to be preferred to stilbœstrol is a matter for further research.

We are indebted to the follow up service of the Toronto General Hospital for sending out the questionnaires in this study.

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THE ABSORPTION OF ENTERIC-COATED AMMONIUM CHLORIDE

By Frances L. Selye, M.D.

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IN view of the work of Selye and his collaborators[1] on the prevention of experimental hypertension and nephrosclerosis in animals by acidifying drugs (ammonium chloride, calcium chloride, etc.) we felt that clinical trial of this principle should be attempted. Ammonium chloride was employed since it had been used so extensively as a diuretic and is non-toxic. Six to eight grams daily in divided doses of the ordinary commercially available enteric-coated tablets were given.

After some months of work with varying results, one patient was sent to the x-ray department for a test of gall-bladder function, and in the course of examination many opaque tablets were noted in her large bowel, even in what appeared to be her sigmoid colon (Fig. 1). From that time a point was made of asking other patients whether they had noticed any tablets in their stools. Of 55 patients, 4 others said they had seen such undigested tablets for some time, but had not thought of mentioning it.

At about the same time a patient with malignant hypertension was admitted to hospital whom we were very anxious to treat rapidly due to the seriousness of his condition. We administered 8 gm. q.d. (16 tablets, each 0.5 gm.) and noted no effect on his blood pressure after a week, although three stool specimens had been carefully checked for tablets and none found. It then occurred to us to recheck his

CO_2 combining power which had previously been high (72.1 and 67.9 vol. %), and which according to all investigators[2, 3, 4] should have been appreciably reduced on this dosage after several days. It was, however, 62.9 vol. %, on the 10th day after the beginning of treatment, from which we were forced to conclude that he had absorbed little or none of the

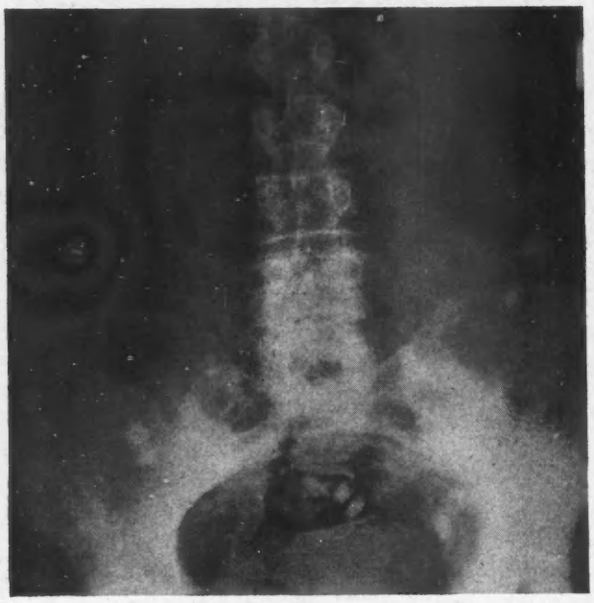


Fig. 1

administered drug. Subsequently, a gastric analysis was done showing an achlorhydria on three specimens, a finding which we thought might have accounted for the non-absorption, although theoretically this should have no bearing on the problem since enteric-coatings are usually fatty acid esters and are chosen for their resistance to hydrochloric acid, dissolving in the alkaline pH of the small bowel.

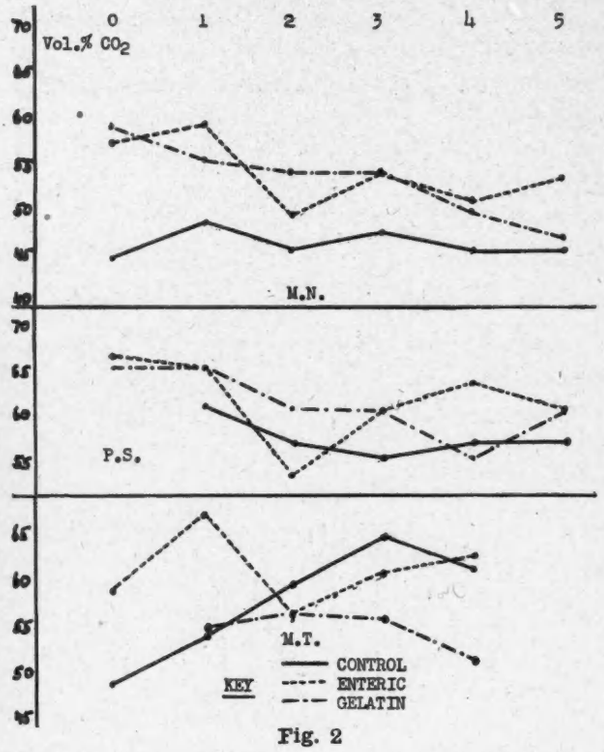


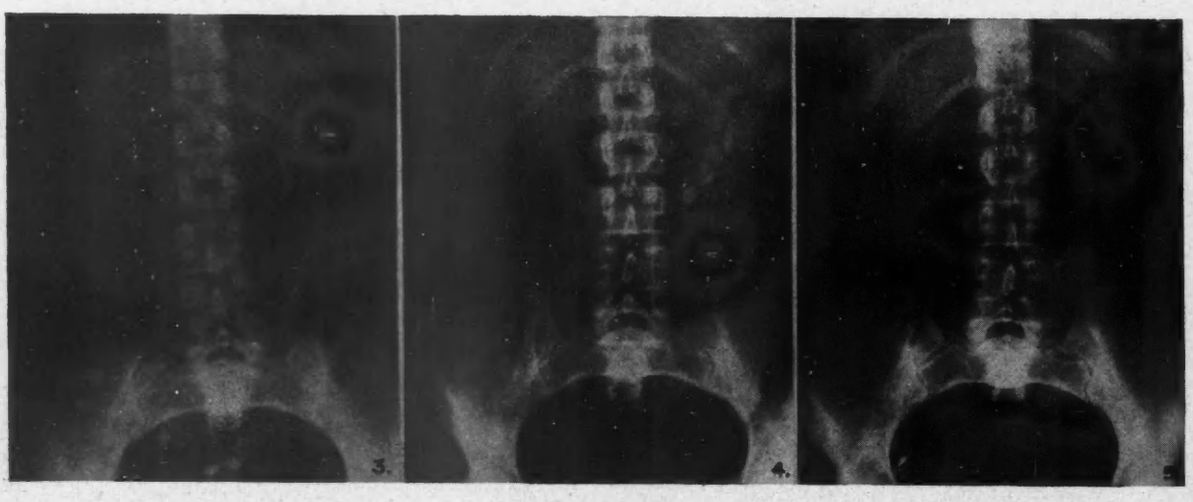
Fig. 2

He was then given ammonium chloride in gelatin capsules which he tolerated well and later he was given some tablets made especially for us,* which were heavily coated with gelatin and had only an extremely thin resinous film. On these he showed an appreciable acidosis compared with his previous levels (CO_2 combining power of 51.8, 59.5, 51.9, 50.3 vol. %) and he also showed a concomitant clinical improvement.[5]

EXPERIMENTAL

We felt that some effort must be made to establish whether this non-absorption was frequent and whether there was a method for its

* Dalitol (Frank W. Horner, Ltd., Montreal)



detection. Accordingly we gave 5 gm. ammonium chloride at one dose to three healthy adults and followed a 5 hour CO_2 curve, hoping that we could establish some constant change in a short period of time which would indicate absorption. Hastings[6] had shown an irregular CO_2 response even in doses up to 15 gm. on a short term curve, but we had hoped that there would be enough change to use this as a gross method, since blood pH determinations (which they had showed to be a sensitive and immediate indication) were beyond the facilities of most clinical laboratories. The three curves in Fig. 2, represent: (1) no treatment; (2) enteric-coated tablets, and (3) gelatin-coated tablets (dalitol). It can readily be seen that there was no constant and appreciable change.

Accordingly we repeated the ammonium chloride administration in the two types of tablet and followed the fate of the tablet directly by x-ray. Figs. 3, 4 and 5, are the plates of the patient M.N. whose blood findings were recorded above. In Fig. 3, we see enteric-coated tablets in the small bowel unchanged at 2½ hours. In Fig. 4, are seen the gelatin-coated tablets at 5 min. after ingestion and in Fig. 5 the absence of the latter tablets at 2 hours.

Similar sets of x-rays were taken on three other healthy young people with the same results. In order to demonstrate whether there was perhaps absorption later than the arbitrarily chosen 2½ hours' interval, two healthy adults received 7 gm. q.d. for 4 days and at the end of this time CO_2 combining powers were in the same range as before treatment (Table I).

TABLE I.

	Pre-treatment	*Post-treatment*
H.D.	54.1 vol. %	61.8 vol. %
P.S.	56.3 vol. %	51.5 vol. %

DISCUSSION

In view of the widespread use of ammonium chloride as a diuretic as well as its potential use in hypertensives we feel that the use of enteric-coated tablets is, at best, unpredictable. We can only say that with the tablets finally used by us we noted gastric discomfort in only 2 out of 60, and in these patients the drug was administered successfully in the usual enteric-coated tablet. Absorption occurred in all cases.

One of the two healthy persons taking the enteric-coated tablets for 4 days, noted constipation, a symptom often ascribed to the use of ammonium chloride. At x-ray some, though not all, tablets which had been taken as long as 28 hours before were seen to be undigested, suggesting that constipation may be entirely on an obstructive foreign body basis rather than a pharmacological effect of the salt. The other person noted intestinal cramps, and she had on previous occasions taken equal doses of untreated pure salt which had not caused this effect although it had given some immediate epigastric burning. These incidents suggest that we must differentiate symptoms occurring from the preparation of the drug from those due to the drug itself.

CONCLUSIONS

1. In a small percentage of cases enteric-coated ammonium chloride tablets pass unchanged through the gastro-intestinal tract.

2. In a larger percentage of cases, and in both healthy young adults tested, prolonged administration of such tablets results in no acidosis although the tablets are destroyed before excretion, presumably at a level too low in the intestinal tract to allow effective absorption.

3. Ammonium chloride when administered in a gelatin-coated tablet is invariably absorbed and only rarely not well tolerated.

We wish to thank F. W. Horner, Ltd., for their preparation of the ammonium chloride tablets and the Department of Radiology of the Royal Victoria Hospital for their kind co-operation.

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OBSERVATIONS ON THE SPRUE SYNDROME*

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Montreal

SPRUE is a disease characterized by steatorrhœa, wasting and anæmia. Its symptomatology has been recognized for centuries; but it is only within the past few decades that its true nature has been elucidated by careful and controlled investigation.

In 1888, Samuel Gee[1] described the "cœliac affection" distinguished by steatorrhœa and cachexia. He recognized it as a disease of both childhood and adult life and described a form of dietary therapy. He expressed no view as to its etiology.

In 1935, Rhoads, Castle *et al.*[2] published the results of a large series of cases studied at Puerto Rico. Their conclusions placed the pathogenesis of sprue in the same general class as that of pernicious anæmia. This concept was based on: (1) Involvement of identical systems, *viz.*, gastro-intestinal, hæmatopoietic and nervous. (2) The occurrence of identical macrocytic anæmias, and (3) the presence of a similar megaloblastic proliferation of the bone marrow.

These impressions were further strengthened by their observations that: (*a*) The alimentary and hæmatological manifestations of sprue were benefited by liver extract. (*b*) Sources of the "extrinsic factor" were beneficial in sprue only after contact with human gastric juice. (*c*) The liver of a patient who died of sprue was found to contain no detectable amount of erythrocyte-maturation factor.

This interpretation appeared to afford a satisfactory explanation of all phases of the problem. Nevertheless, in 1942, Hurst[3] published a concept of the etiology of sprue which was at direct variance with that of the above workers. This article suggested that the underlying basis of this syndrome was a widespread paralysis of the muscularis mucosæ of the small bowel and its extensions into the intestinal villi. Such paralysis was stated to result in the cessation of the normal pumping action of the villi, and consequent impairment of the absorption of fat. This hypothesis explains satisfactorily the radiographic findings but fails to satisfy other phases of the problem. The interpretation advanced by Rhoads and Castle is generally considered to be the more rational.

Hurst's contribution, however, was that of classifying the various terminologies, *viz.*, "tropical sprue", "non-tropical sprue", "cœliac disease", "idiopathic steatorrhœa" and "chronic jejuno-ileal insufficiency" into one common entity, which he designated as "the sprue syndrome". In 1944, Hanes[4] crystallized the diagnostic criteria in sprue without attempting to add to our views as to its causation. In the same year, Moore, Vilter, Minnich and Spies,[5] brought the nutritional macrocytic anæmias of avitaminosis into the same category.

Following the isolation of the lactobacillus casei factor and folic acid, and the demonstration of their efficacy in pernicious anæmia it was natural that these results should be applied to the treatment of sprue; and very recently Darby, Jones and Johnson,[6] have shown that the L. casei factor is effective in the sprue syndrome.

It would appear to us that chronic diarrhœas with impairment of fat absorption, secondary to mechanical derangements of the bowel should logically fall within the boundaries of the sprue syndrome. Experience has shown that such

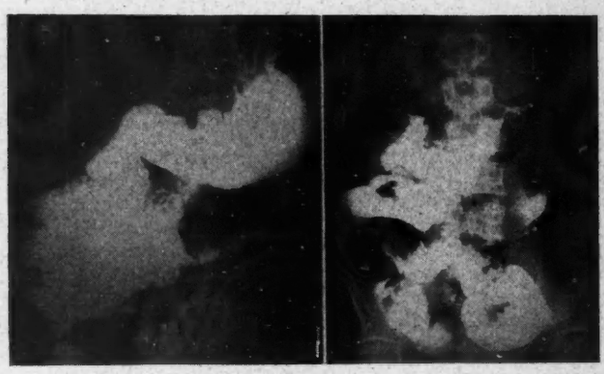

Fig. 1

secondary cases may develop both gastro-intestinal and hæmatopoietic disturbances in varying relative degrees, indistinguishable from those of primary sprue. We submit that if this view is accepted, the terms "primary" and "secondary" sprue may well be employed as an etiological distinction. Hurst's case of sprue syndrome from obstruction of the lacteals by chronic tuberculosis of the mesenteric lymph nodes is a case in point.

Diagnosis.—The diagnostic criteria, modified from Hanes (*v.s.*) are as follows:

1. Steatorrhœa—in the absence of which a diagnosis of sprue may not be made.
2. Weight loss—which follows naturally on the preceding feature, and may be more marked than in almost any other wasting disease.

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† Resident Staff, Montreal General Hospital.

3. Flat glucose tolerance curve—this phenomenon is considered to be the result of impaired carbohydrate absorption and is a relatively constant though not pathognomic finding.

4. Macrocytic anæmia—it is inherent in the modern view of the pathogenesis of the sprue syndrome that macrocytic anæmia be a relatively constant finding in this disease.

5. Hypochlorhydria and achlorhydria—these disturbances of gastric secretion frequently occur, but there is no such constancy in the finding of absolute achlorhydria as occurs in pernicious anæmia. In doubtful cases, therefore, the presence or even a minimal degree of free acidity may be of high diagnostic value.

6. Radiologic abnormalities: These include (*a*) loss of the usual feathery pattern of the small bowel mucosa with its replacement by a coarser pattern, or with the entire disappearance of pattern; the latter being known as the "Moulage sign", (*b*) the separation of the barium in the small intestine into dilated, bag-like or sausage-shaped clumps, of various lengths, and with smooth contours.

7. The presence of excess of total fat in the stools with normal proportion of split fat. This may be recognized by microscopic examination of the stools or by the more laborious but highly accurate chemical estimation of neutral fats and split fat (fatty acids and soaps).

We consider that practically all cases may be recognized by consideration of the criteria herein outlined. It should be stressed that the absence of one or more of these findings does not prohibit a diagnosis of this syndrome if the remaining features are sufficiently convincing Other physical findings such as glossitis and cutaneous manifestations, are frequently noted but are not considered diagnostically obligatory.

TREATMENT

The present conceptions as to etiology direct the treatment into rather obvious categories. These are:

1. Dietary.—Since the presenting symptom of steatorrhœa is the result of deficient fat absorption, treatment is directed towards supplying the caloric requirements by protein and carbohydrate alone. A diet high in these elements and free of fat is therefore indicated. In long-standing cases, the small bowel may temporarily lose most of its capacity for absorption; and in such cases, an initial period of parenteral therapy may be necessary. For this purpose the newer split-protein products have been found to be admirably suited. As treatment progresses, the bowel usually regains its ability to absorb small quantities of fat; and at this stage, fat may cautiously be added to the diet.

2. Liver extract.—The studies of Rhoads and Castle indicated that liver extract is of paramount importance in supplying the underlying deficiency which is believed to be responsible for both gastro-intestinal and hæmatological manifestations. This should be administered in adequate dosage, as for the treatment of pernicious anæmia.

3. Vitamin therapy.—In the presence of deficient intestinal fat absorption, it is logical to assume that the absorption of fat-soluble vitamins A, D, and K, will also be deficient. These may therefore, be supplied parenterally. The B complex vitamins are probably supplied in satisfactory quantities in the liver extract.

An illustrative case report follows:

W.R., a 42-year old male was admitted to the medical wards of the Montreal General Hospital on November 1, 1945, with complaints of chronic diarrhœa of six years' duration, abdominal pain and distension, vomiting, flatulence and marked weight loss. He had undergone numerous hospitalizations, during two of which diagnostic laparotomies had been performed. The initial operation in March, 1939, had disclosed gross dilatation of the duodenum, and an enlarged mesenteric gland, removed for biopsy, had revealed marked fibrosis. A pathological diagnosis of mesenteric tuberculosis had been entertained but not definitely established.

Later in 1939, a second laparotomy was performed. It was alleged to have established that the previously-noted dilatation of the duodenum was the result of pressure from an aberrant inferior mesenteric artery. This pressure had been relieved by a duodeno-jejunal anastomosis. Following laparotomy the symptoms persisted unchanged, and he had undergone further investigation with the following findings: (1) Stool culture showed the usual fæcal organisms in the usual proportions; (2) pus, blood, and mucus were absent on repeated examination; (3) gastric analysis showed hypochlorhydria; (4) x-rays of the chest showed evidence of an old apical tuberculosis; (5) a barium series was inconclusive because of the disturbance of the normal bowel relationships as a result of the previous operations.

On admission to hospital, physical examination disclosed an intensely emaciated male who, in spite of marked weight loss, was comfortable, and did not appear severely ill. The skin showed moderate pallor, and the complexion was "muddy" but not icteric. The tongue was normal. The thyroid was not enlarged. The chest was clear. With the exception of a faint apical systolic murmur, the cardiovascular system was negative. The abdomen showed marked distension. There was a right paramedian incisional scar. The entire abdomen was remarkably "doughy" in consistency. No masses were felt and no free fluid was demonstrated. The liver and spleen were not palpable. The skin and subcutaneous tissue showed marked depletion, particularly about the buttocks. Rectal examination was negative, but there was a small amount of bright yellow soft greasy stool on the examining finger. There were no other positive findings.

The history, physical examination and the previous hospital findings suggested that the symptoms were not due to an inflammatory lesion of the bowel; and the impression, coupled with the characteristics of the stool on rectal examination, suggested that the diarrhœa was of metabolic origin. A tentative diagnosis of (*a*) pancreatic insufficiency, or (*b*) sprue syndrome was made; and investigation was directed along appropriate lines.

Laboratory findings.—The blood showed a mild macrocytosis with a cell diameter of 8.0 microns but no gross anæmia. Blood urea nitrogen was 18 mgm. per 100 c.c. Van den Bergh was 0.4 units. Fasting blood sugar was 0.111. Total plasma proteins were 5.6%; albumen 3.85%; globulin 1.35%; fibrinogen 0.03%. Blood Wassermann was negative. The stools were yellowish, frothy and soft, had a fatty appearance and contained no blood, pus, mucus, parasites nor ova. Sigmoidoscopy showed mild atrophy of the mucous membranes. Gastric analysis showed absolute achlorhydria. The glucose

tolerance curve was not flattened. A barium series showed: (1) Fragmentation and scattering of the barium. (2) Loss of the normal feathery pattern of the small bowel mucosa. (3) The appearance of sausage shaped loops of bowel.

The radiologist's report indicated a typical deficiency pattern consistent with the diagnosis of sprue syndrome.* X-rays of the bones showed moderate osteoporosis. Chemical examination of the stools showed: total fat, 70% of dried fæces; neutral (unsplit fat), 23% of total fat; fatty acids (split fat), 77% of total fat.

The chemical findings in the stool indicated that pancreatic function was adequate, and that the steatorrhœa was the result of deficient absorption rather than impaired digestion.

These findings were considered to be diagnostic of the sprue syndrome and a treatment plan was outlined, as above, to include diet, liver therapy, vitamins and hydrolyzed protein parenterally.

The results of treatment were satisfactory, with improvement in the diarrhœa and a gain of 17 lb. within two weeks. There was little change in the hæmatological findings, which had not been conspicuous at the beginning of therapy. We considered that the dramatic clinical response constituted a satisfactory therapeutic test and corroborated the original diagnostic impression. Unfortunately the patient left hospital against advice before treatment had been completed, and evaluation of the long range results of treatment was impossible.

We believe that this case falls into the group which we would classify as "secondary" sprue. The basic etiology, we consider to be, either (*a*) disturbance of the anatomical relationships of the small bowel or (*b*) comparable to Hurst's case of sprue syndrome secondary to mesenteric tuberculosis.

Since the above case was studied, we have observed another patient in which imperative surgical interference, occasioned by gangrene of the small bowel, resulted in a comparable syndrome in which the hæmatological findings were outstanding and the alimentary symptoms secondary. Satisfactory response of both disturbances resulted from parenteral liver therapy alone. The latter case, we believe, also supports the view that secondary or "mechanical" sprue should be recognized as an entity.

CONCLUSIONS

1. The steatorrhœa characteristic of the sprue syndrome is due to impaired fat absorption from the small intestine.

2. The etiological factors should be recognized as falling into two groups: (*a*) Deficiency of "extrinsic" and "intrinsic" factors as in pernicious anæmia. (*b*) Mechanical factors preventing absorption from the small bowel, such as lymphatic obstruction and operative disturbances of anatomical relationships.

3. Deficiencies of ingestion and absorption produce hæmatopoietic disturbances similar to those of pernicious anæmia.

* We are indebted to Dr. J. W. MacKay, Radiologist, Montreal General Hospital, for the radiological interpretations. Specimen radiographs are shown in Fig. 1.

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INTRA-ABDOMINAL PRESSURES

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IN 1930 Livingston[1] wrote: "In contrast to the frequency with which this term intra-abdominal pressure appears in surgical writings, little or no reference to the subject is found in textbooks of physiology. These source books offer little aid."

This statement still keeps all its freshness in 1946, for even the most recent treatises on physiology have not yet found a place in their index for the term "intra-abdominal pressure". The number of special articles on it published in the U.S.A. in the last 30 or 35 years would not be over 12.[2 to 10]

PHYSIOLOGICAL AND PATHOLOGICAL ASPECTS

Among the numerous phenomena which are likely to influence the intra-abdominal pressures (I.A.P.) or to be influenced by them, pulmonary respiration deserves an important rank. Respiration, even of the most quiet type, would not permit complete rest in the abdominal cavity unless this thoroughly changed its form, its dimensions, and, consequently, its internal pressures at least 30 times in a minute. Although we read in Best and Taylor[11] that "the diaphragm is the chief muscle of respiration, its movements being responsible during deep breathing for 60% of the total amount of air breathed", we still cannot forget that the diaphragm constitutes one of the great muscular segments of the abdomen. This being so, I cannot but think that a significant proportion of the respiratory act until now attributed to this important muscle should really be ascribed to the physiological play of I.A.P. This should especially be so when, in considering coughing, we realize that this abdomino-thoracic partition has no great respiratory value except inasmuch as, supporting itself against the closed glottis and the thoracic contents, it participates in the

"mise-en-tension" of the abdomen with the other muscles of the abdominal periphery.

The lung specialist has certainly done well not to wait for a more thorough knowledge of I.A.P. physiology before carrying out the injection of large quantities of air into the peritoneal cavity, as have Banyai,[12, 13] Rilance,[14] LaRue-Henderson[15] and many others. This procedure, however, should modify the status of abdominal pressures for a long while. When the same specialist, by direct surgical action upon the phrenic nerve, obtains a pulmonary collapse, he will probably admit with us that the desirable effects of the rise of the paralyzed hemidiaphragm can be explained, at least partially, by the effects of the repeated elevation of I.A.P. It is indeed my opinion that, even after phrenic nerve surgery, coughing, straining at stool, or any other severe physical efforts are still able to produce very high peaks of pressure inside the abdomen, which directly react on the denervated hemidiaphragm. A third example of the lung specialist being able to modify profitably the I.A.P. is when, with Alexander and Kountz,[16] he treats serious cases of pulmonary emphysema by the wearing of a special belt "in order to maintain an adequate intra-abdominal pressure".

The gastro-enterologist is regularly consulted by those thin and elongated patients who suffer from various symptoms and, among many other therapeutic measures, he often prescribes to them the wearing for a long time of an individually designed corset, thus trying to bring about permanent relief of their symptoms by the use of a permanent artificial abdominal wall which would raise their I.A.P. to a comfortable level. He may recognize too that some cases of gastric ulcer in man do not fit their psychoneurotic etiology (that *dernier cri!*) and, then, if he reads A. C. Vietor,[17] he will find many good reasons to consider splanchnoptosis as "a potential anatomical path to gastric and duodenal ulcers". Where then is the explanation of splanchnoptosis if not in the physiopathology of the I.A.P.?

The cardiologist does not forget that the variations, respiratory or others, of the I.A.P. may constitute one of the most important factors in the blood circulation. As early as 1926, A. E. Fossier[18] considers essential hypotension as a symptom of splanchnoptosis; it must be our aim to increase the abdominal pressure, "thus raising the diaphragm and thereby giving a better support to the heart". In 1940, W. S. McCann[19] attributes some cases of orthostatic hypertension to visceroptosis. Also in 1940, N. C. Gilbert *et al.*[20] have tried with some success to demonstrate the action of gastric distension pressures on the circulation in the coronary arteries.

Though, generally speaking, it might be said that hernia is probably one of the most easily diagnosed and most adequately treated human diseases, the pathogenesis of this so well-defined syndrome is still a subject of debate. In 1945, Minty and Minty[21] say: "The weight of medical opinion in regard to the cause of hernias is that they are a result of a congenital weakness in the individual"; but in 1917 Pitzman-Marsh[22] said: "The theory of congenital malformations as the cause of hernia reached the height of its popularity about 20 years ago". We turn then to the opinion of M. Cherner[23] who, in 1940, wrote: "In spite of all discussions, both written and oral, upon the subject of hernia, the problem seems to be of as much interest and importance today as it was fifty years ago". Once more we ask the question: where is the explanation of hernia and its recurrence or re-recurrence if not in the physiopathology of the I.A.P.? We could continue in this vein for a long time. For instance, in accord with recent articles published, we could put forward the importance of I.A.P. studies to the gynæcologist, the urologist, the obstetrician, and other specialists. Let it be sufficient to sum it up by pointing out prosaically, that you cannot sit down or get up, you cannot lift burdens, walk, cough or sneeze, expel any foreign body from one end or the other of your alimentary tract, laugh, sing, speak loudly or even breathe deeply before you have created, consciously or not, the necessary amount of pressure in your abdomen.

TERMINOLOGY

Some definition of the principal terms to be used is necessary.

1. *The abdominal cavity.*—This is the space limited by the diaphragm above and the musculo-aponeurotic perineum below, by the lumbo-sacral column posteriorly and the walls of the abdomen antero-laterally. We consider the pelvic cavity as a purely conventional division of the abdominal cavity. From the point of view of I.A.P. studies, it does not exist.

2. *The abdominal contents.*—The abdominal cavity contains the whole of the digestive system, less the œsophagus; the whole of the genitourinary system, less part of the urethra and vagina; many important blood vessels and lymphatic organs; and, moreover, a serous membrane, the peritoneum, which has often misled and sometimes completely mystified experimentors on I.A.P.

One has to take the peritoneum for what it is. Indeed, if the peritoneum, considered in all its anatomical details, virtually takes up a large space submitted to the laws of I.A.P. as are the rest of the abdominal contents, it also forms, by the numerous folds of its perivisceral sheets, many ligaments and mesenteries whose functions are to support afferent and efferent circulation and innervation and, also, to oppose their action to that of gravity upon several abdominal organs.

3. *The intra-abdominal pressures.*—Under this term we wish to include all pressure phenomena that may possibly take place within the limits of the abdominal cavity.

Personally, I do not like this prefix "intra" which is so persistently added to the term "abdominal pressure". Whilst there can be abdominal pressures due to extra-abdominal causes, I think there is too much chance of this not very useful prefix making the term "intra-abdominal pressures" into a misnomer. Nevertheless, I shall continue to use the word "intra" throughout this article, but only for tradition's sake.

4. *The modalities of intra-abdominal pressure.*—In principle, all parts of the abdominal contents are capable of being influenced by I.A.P. In practice, however, one cannot conceive the possibility of measuring the I.A.P. everywhere in the abdomen. For example, it would not be feasible to measure the pressure that exists at a certain moment in the middle of the hepatic parenchyma. Practically as well as theoretically one may say that I.A.P. can be measured wherever an intra-abdominal fluid, natural or artificial, can transmit the pressures exerted upon it to an extra-abdominal manometer. As the abdomen is, after all, a great hollow muscle, it may therefore be said that all these pressures fall under two groups of modalities.

"A" modalities.—The I.A.P. can be studied either inside the hollow viscera of the abdomen —intestine, bladder, stomach, etc., or outside these same organs. There are therefore two modalities of the I.A.P., namely, the intra- or endo-visceral pressures; and the intra-peritoneal pressures.

Here, again, the particle "intra" appears as a useless prefix to the term "visceral" and "peritoneal pressures". In fact, if one is thinking about intra-visceral pressures he will easily refer to all other abdominal pressures as being extra-visceral, *i.e.*, intra-peritoneal. On the other hand, if one is thinking about intra-peritoneal pressures one will easily refer to all other abdominal pressures as being extra-peritoneal, *i.e.*, intra-visceral.

Until now the terms intra-peritoneal and intra-abdominal pressure have often been taken as synonymous in the medical literature. They have even been very freely exchanged in the same article. For example, it has been written: "There is always a variable amount of pressure in the peritoneal cavity, known as intra-abdominal pressure";[4] or "Briefly stated, intra-abdominal pressure, or more specially, intra-peritoneal pressure, is the resultant of . . .";[24] or "That intra-abdominal pressure is normally negative is satisfactorily demonstrated by clinical observations and laboratory experiments";[6] or even, "The intra-abdominal pressure is not intra-peritoneal but rather endo-visceral in its manifestations and, under normal circumstances, is made to equal the atmospheric pressure by the degree of tone of the abdominal musculature".[25] C. R. Lam[10] has made laudable efforts to bring to an end this confusion of ideas and concepts, but, unfortunately, he continues to classify the I.A.P. under the three old headings, the intra-abdominal pressure, the intra-peritoneal, and the intra-visceral pressures; thus failing to note that the second and third of these terms cannot indicate more than modalities of the I.A.P. Intra-visceral pressure is to be regarded as the variable amount of pressure developed in a hollow abdominal viscus by the actual tonus of its own parietal muscular fibres or by distension of ingestive, secretory or excretory origin.

From the point of view of general physiology, our division of the I.A.P. into these two modalities would probably appear more didactic than practical. This we concede, but it is obvious that the study of some particular intra-

visceral pressure can afford much information. A number of recently published articles on the subject of cystometry has already proved the importance of measuring intra-vesical pressures. Intra-gastric minute variations of pressures have also recently been studied by Thornton *et al.*[26] as a means of emphasizing the value of the section of vagus nerve branches in the treatment of gastric ulcer.

"B" modalities.—The I.A.P. can be studied either during the conscious or unconscious rest phase of the abdomen's muscular walls, or during their total or segmentary active phase, whence we have two other important forms of the I.A.P., namely: the static intra-abdominal pressure (S.I.A.P.), and the dynamic intra-abdominal pressure (D.I.A.P.).

The S.I.A.P. is to a large extent, a relation between the weight and volume of the abdominal contents and the capacity of the abdominal cavity, which capacity also depends on the state of tonicity of the abdominal muscle. As will be proved later on, posture is the most direct factor in causing variations of these pressures.

The D.I.A.P. is the pressure exerted on the abdominal contents by any voluntary or automatic contraction of one or a group of abdominal muscles. As will be seen later on, when the abdominal cavity has reduced its potential capacity by assuming its most spherical form, that is after a deep inspiration and closure of the glottis, and when the entire abdominal muscle energetically contracts, very high pressures are created and transmitted to and through all parts of the abdominal contents. Only under these conditions do the abdominal contents behave like a true hydrostatic medium in a rigid container.

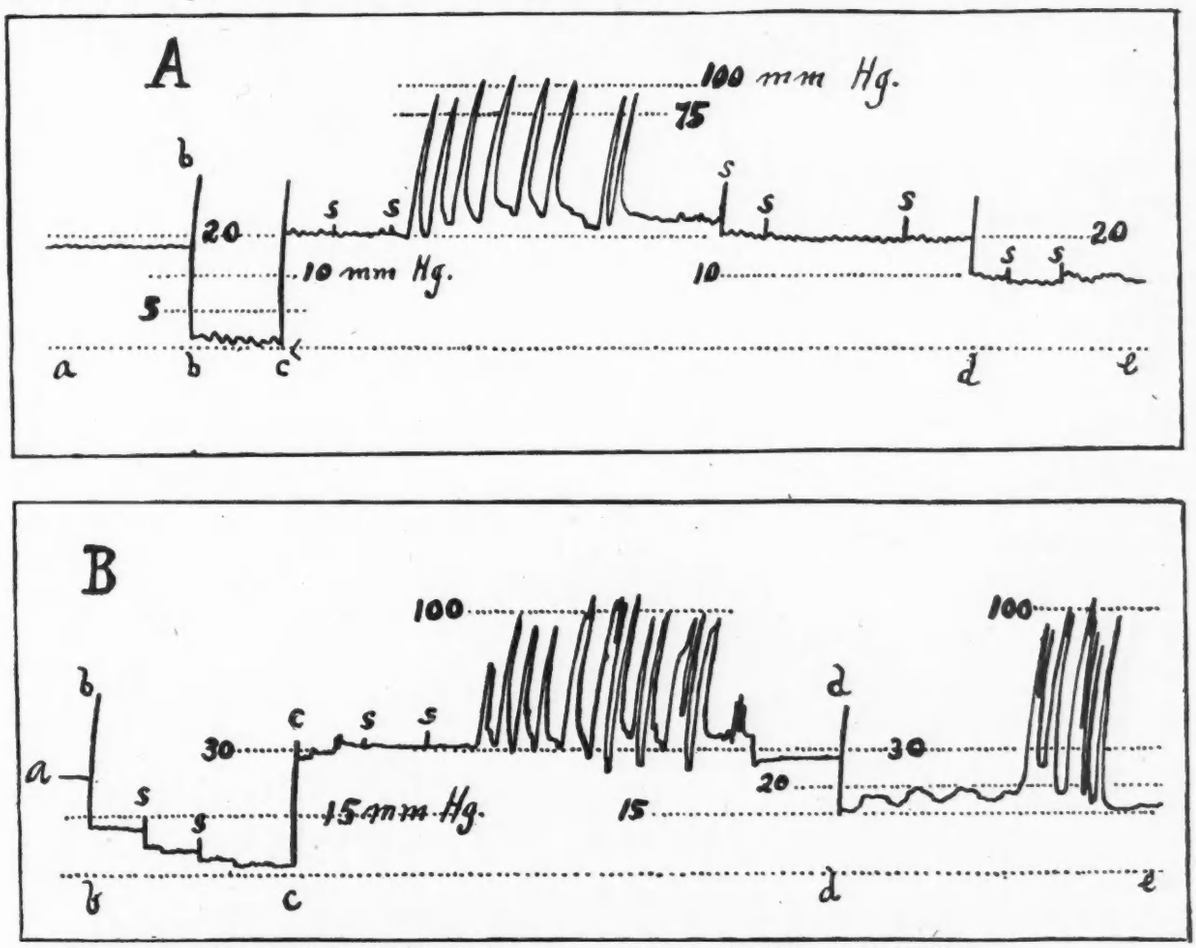

Fig. 1.—A: Man, aged 21, abdominal circumference 33", height 68", weight 153 lb.
B: Woman, aged 29, abdominal circumference 36", height 63", weight 175 lb.
a – b: Initial supine posture.
b – c: Knee-chest.
c – d: Erect.
d – e: Second supine posture in A and prone-horizontal in B.
Every point marked with a letter indicates either a change in posture, or a stop varying from 15 to 60 seconds in the unrolling of the kymograph paper.
Every marked rise has been produced by violent coughing.

THE PRACTICAL MEASUREMENT OF HUMAN INTRA-ABDOMINAL PRESSURE

As I am aware that I.A.P. and its variables have been one of the most neglected subjects in the field of general physiology, and, as I believe that no further progress can be made in the physiopathology of these pressures so long as physicians are without an accurate and easy method of measuring them, I have evolved a method which seems to enable us to register any variation of the I.A.P. This method has been qualified by a friend as "discouragingly" simple, but I present it as it is, hoping that it will be improved on if found inadequate.

Small rubber balloons of 10 c.c. capacity were made from hand-sealed surgical drains and fixed at the end of convenient rubber tubings. These balloons were then introduced into different parts of the abdominal cavity and inflated with 8 c.c. of air. The tubes were subsequently connected to not too sensitive but sturdy enough metallic tambours whose excursions under pres-

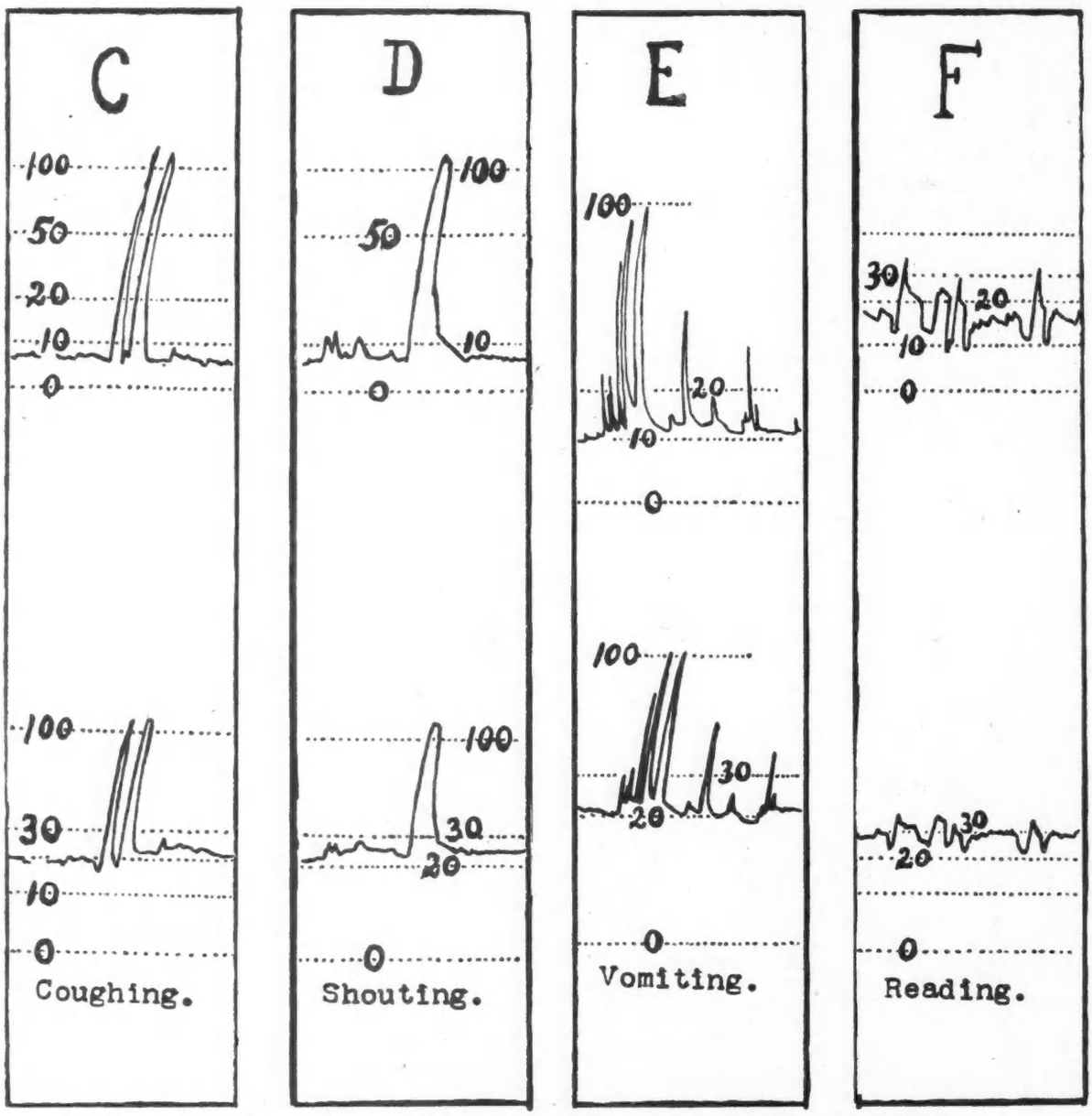

Fig. 2.—C, D, F: Man, aged 23, abdominal circumference 31", height 69", weight 149 lb.
Upper graphs: from gastric balloon.
Lower graphs: from rectal balloon.
E: Woman, aged 34, multiparous, in supine posture, weight 143 lb.
Upper graph: from intra-peritoneal balloon introduced through a midline incision for epigastric hernia operation.
Lower graph: from rectal balloon.

sure were transmitted through ordinary multiplying devices and registered upon an electric kymograph at any desired speed.

Fig. 1 shows 2 abdominographs taken from my own series. I shall not discuss the true significance of every fluctuation in these graphs, neither shall I compare them with each other, because I feel that no valuable scientific data can be gained from such comparisons unless one has at least many hundreds of identical records to compare. My purpose in presenting these graphs is to prove the ease with which a good number of S.I.A.P. and D.I.A.P. variations can be registered in the same short session—about 15 minutes — by introducing a small rubber balloon just above the anal sphincters. Tiny waves seen on graph A, between b and d, are local respiratory I.A.P. variations. As can be observed on Fig. 3-G, these variations may eventually be of greater absolute value. Among the interesting features of graph B, are the three long waves of peristaltic rectal contraction which can be noticed between d and e, and, if my reasoning is correct, the height of these waves is the true measure of this intra-visceral pressure.

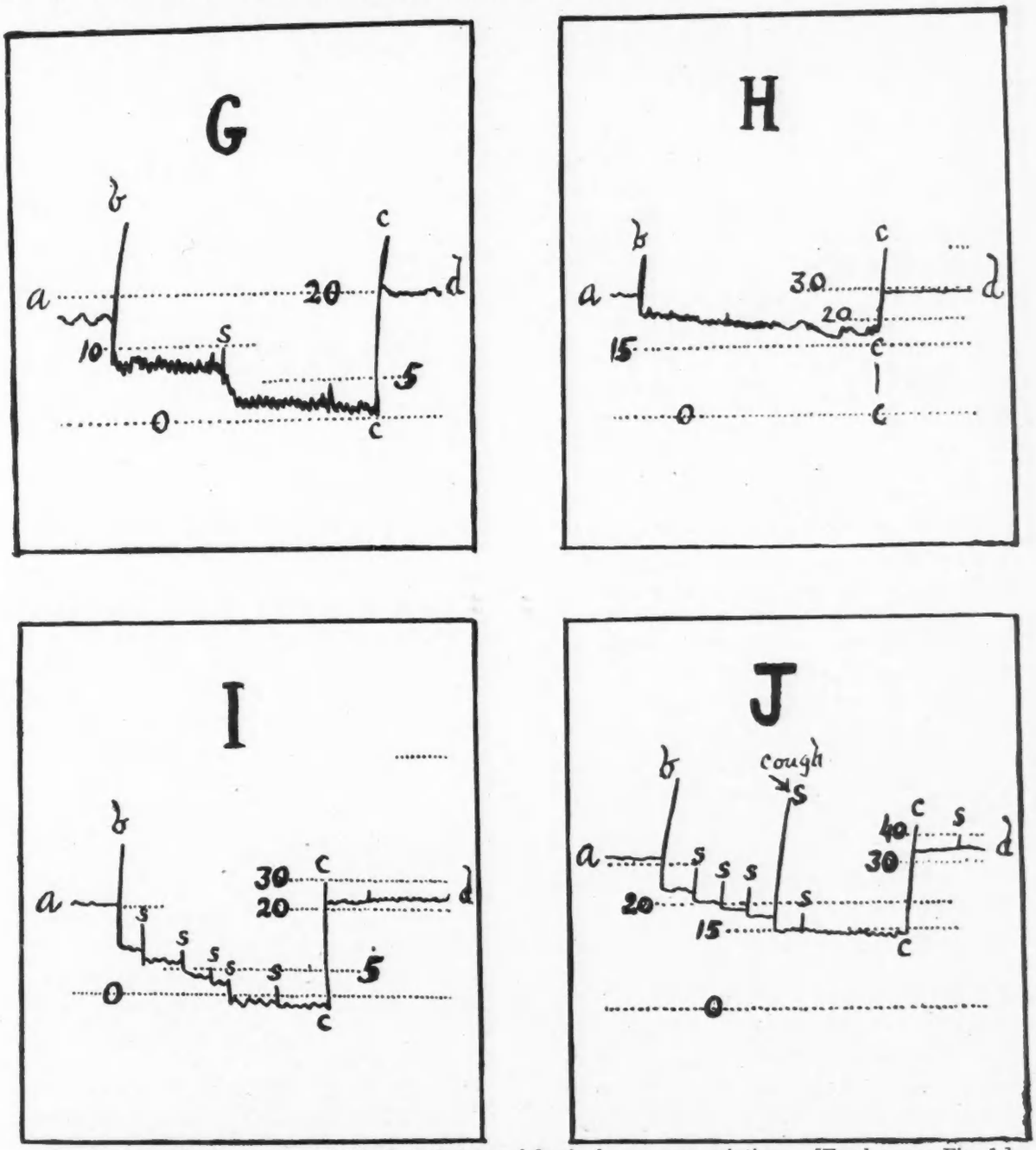

Fig. 3.—Knee-chest posture individual static intra-abdominal pressure variations. [For key see Fig. 1.]

Fig. 2 presents 4 metrograms of D.I.A.P. variations registered simultaneously at two distant points of the abdominal contents. Any one of the graphs C, D or E, is the picture of a particular strong abdominal muscle contraction. The ensemble of these 3 graphs makes it obvious that a strong muscular contraction of the total abdominal periphery will bring about the same peak of high pressure at any point of the abdominal contents where, prior to this contraction, the initial static pressure was 5, 10, 20, 30 or even 40 mm. Hg. Hence, it is suggested that the most generalized and active I.A.P. variations can be measured with as much accuracy at a single point of the abdominal contents as by simultaneous measurements at several distant points. This would give extra value to the interpretation of Fig. 1 graphs which were registered from a single balloon introduced into the most accessible abdominal viscus. Graph F gives an example of moderate D.I.A.P. variations. It shows an overall correspondence of the pressure waves registered at two distant points in the abdomen while these points were submitted to the same cause of variation in local pressure, but, as the physical exercise involved in this experiment did not require a complete and violent participation of the entire abdominal muscle, it does not show identical summits of high pressure in both waves.

All 4 graphs of Fig. 3 have also been recorded through rectal balloons. I think these graphs will give some idea of the S.I.A.P. pathological variations one may expect to encounter when the observed subjects are asked to assume the knee-chest posture. G probably tells the simple story of a normal uterine retroposition. H illustrates the poor mobilization of the pelvic viscera in a case of chronic parametritis and left chronic salpinx. Both I and J are chapters of the gastroenteroptotic romance, but J, objectively and subjectively, is much more pathetic.

Negative intra-peritoneal pressures under the diaphragmatic dome have often been reported by experimenters. "Because of the location of the abdomen", writes Livingston[1], "separated from the pleural cavities only by a thin musculo-fibrous membrane, the upper portions of the peritoneal cavity display a slight reflected negativity, subatmospheric or tension phenomenon showing the presence of an upward pulling force". I am ready to endorse this generally approved concept of the subdiaphragmatic peritoneal negativity and will even agree to give up the knee-chest "garrulitis vulvæ" to the physiology of the pleura if it can be proved that these two negative-pressured serous membranes can, by their sole existence, increase the abdominal capacity. Fig. 4 - K

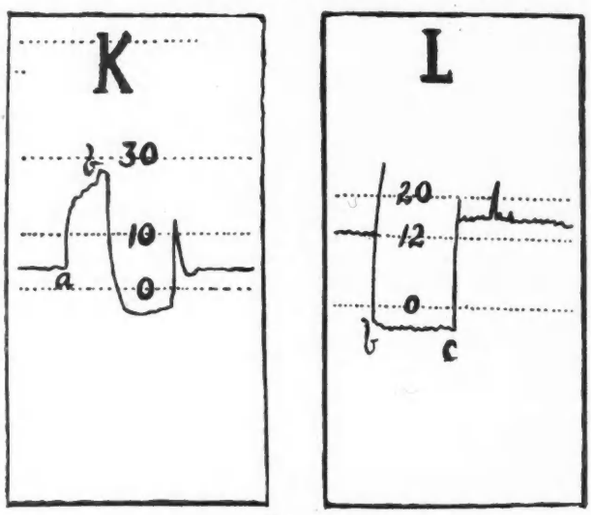

Fig. 4

K: Gastric negative pressure induced by bulging out the thorax and abdomen after a deep expiration (a – b).

L: Example of regular pelvic negative pressure induced by assuming the knee-chest posture (b – c).

shows what happens within the stomach when, after a deep expiratory movement, the erect man bulges out his thorax and abdomen while his glottis remains closed. As can be noted, this procedure develops an important negativation of the I.A.P. in the stomach, as it probably induces a strongly negative intrapleural pressure, but there seems to be no good reason to believe that the subdiaphragmatic peritoneal space would not participate in this gastric negativity, at least as much as it participates in the pleural negativity. As shown in Fig. 4 - L, the I.A.P. measured in the rectum is often found to be negative when the subject assumes the knee-chest posture, and we think this phenomenon presents a close analogy with the subdiaphragmatic peritoneal negativity in the erect posture. Both of these negativities probably come from a normal disproportion between the abdominal capacity, which is often greater, and the volume of the abdominal contents, which is often less.

COMMENT

The suspended solution of so many clinical problems more or less intimately connected with the I.A.P. appear to us as a stimulant to

a fair study of the normal and pathologic variations of these pressures. The few graphs hereby reproduced merely lift a corner of the veil which conceals the laws of I.A.P. variations in man. The relative inadequacy of our own measuring equipment and, also, the lack of publication space, prevent us from trying just now to unveil more of these laws. For instance, static I.A.P. variations have been studied on human subjects lying on a tilting device and records have been made while the tilting board was slowly moved from a 75 degree head-up to a 75 degree head-down position. Two or three graphs obtained through this procedure would give weight to the opinion that the static pressures in the upper abdomen might not increase in the same proportion as they decrease in the pelvis when the subject, prone or supine, is progressively brought from the horizontal to the head-down position. In other words, the static pressures encountered in and around such important abdominal viscera as the stomach, the duodenum, the transverse colon, the liver, the gall-bladder, the pancreas, the spleen and even the kidneys, are lower in the erect posture than the corresponding static pressures in the pelvis, but, though such extreme attitudes as the head-down position or the knee-chest posture would substantially diminish the static pressures in the lower portion of the abdominal cavity, they would not increase to the same degree the corresponding static pressures in the above mentioned viscera. If this theory happens to be confirmed by further experiments, it would establish the fact that, whatever may be the habitual posture of the subject, the easy blood irrigation of the aforesaid organs and, consequently, their comparatively high secretory and peristaltic activities, are not interfered with.

SUMMARY

1. The importance of I.A.P. studies is stressed.

2. A new concept of I.A.P. definitions and classifications is formulated.

3. A personal method for registering the I.A.P. variations is described.

4. Preliminary statements are made regarding the general laws of I.A.P.

It is a pleasure to thank Dr. Eugène Robillard, chief of the laboratory of general physiology at the University of Montreal, for his continued counsel and interest during the course of this work.

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FURTHER STUDIES ON ULTRAVIOLET RADIATION IN SURGERY

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IT has been stated recently that there are now 1,500 hospitals and 300 schools in the United States which are provided with ultraviolet germicidal equipment for air purification. The installations are in various parts of the hospital, including in some cases the operating rooms. The extensive and increasing adoption of such protective equipment seems to be due to the recognition by hospital authorities of four facts:

1. The development of aerobiological studies and the consequent understanding of the importance of air-borne micro-organisms in medicine, surgery, and public health.

2. The efficiency of ultraviolet germicidal radiation as demonstrated both experimentally and in widespread practical use.

3. The safety of such radiation when tested by experimental methods and clinical experience, provided the proper precautions are observed at all times.

4. The acceptance of the Council on Physical Medicine of the American Medical Association of standard ultraviolet equipment for the uses

stated in such approval, and under the standards and limitations given therein.

These four facts have removed from the use of ultraviolet those earlier uncertainties, misgivings, and questionings which attend—and properly so—the coming of almost every advance in medicine or surgery. This is not to assert that the last word has been said or the last challenge met. Further studies are still needed and will be made. The manufacturers of ultraviolet generators will steadily improve the equipment, and operating rooms, auxiliary rooms, wards, and private rooms of the future will probably be planned in such a way as to make possible the optimum use of such means of air purification.

It is reported that early this fall the United States Navy Department, Bureau of Medicine and Surgery, will begin an extensive study of germicidal air disinfection in surgery. The project will be carried out in the Surgical Department of the United States Naval Hospital at Philadelphia under the direction of Captain T. L. Willmon, Bureau of Medicine and Surgery, Naval Department, Washington, D.C.

The most recent literature issued by the largest manufacturers of ultraviolet equipment for air disinfection avoids exaggerations and unwarranted claims, and seems ethical from every standpoint.

It is not the purpose of this paper to speak either for or against the use of ultraviolet radiation in surgery. That is for the surgeon to decide, and the decision may vary with the needs and nature of the surgery involved, the construction and dimensions of the operating room, the reflectivity of its surfaces, and the rate of incidence of postoperative infections encountered locally.

The writer has heard more than one surgeon say "But what do we need ultraviolet for, anyway? Postoperative infections have dwindled to the vanishing point under the best modern surgical technique, and our own rate here is so low as to be negligible."

Some other surgeons, equally competent and equally conscientious, have something quite different to report, however, and I will leave it to them to say it.

Moreover, the undesirability of wound contamination, even if outright infection does not develop, has been stressed by many surgeons, and the prevention of air-borne contamination is a most important function of germicidal irradiation.

EXPERIMENTAL OPERATIONS

The primary purpose of this paper is to give a brief report on further experimental studies, —a smaller series to supplement the fifty operations described in a previous paper.[1] The same general procedures were followed, making repetition of technical details unnecessary. The only noteworthy changes were the use of nembutal anæsthesia, and the use of two portable or "spot" generators for direct irradiation of the operative field. The animals used were rabbits.

The degree of irradiation was of high germicidal efficiency but well within the limitations laid down by the Council on Physical Medicine of the American Medical Association. As the fifteen minute period of irradiation was entirely uninterrupted, it would probably be a much greater exposure in total than in actual operations where the surgeons' hands, sponges, gauze, etc., interrupted the exposure continually.

Some of the operations were for the exposure of viscera other than those used before, and concerned the liver, spleen, kidney, and adrenal glands. Other operations dealt with structures encountered in orthopædic surgery. In a few animals the medial surface of the thigh was incised, and the femoral artery, great saphenous artery, femoral vein, and greater saphenous nerve were very carefully exposed with an absolute minimum of surgical disturbance, and all these structures then received direct irradiation. In other animals a longitudinal incision was made over the proximal half of the tibia, permitting the tibialis anterior and the extensor digitorum longus muscles to be drawn aside from the anterolateral surface of the tibia, and the extensor hallucis longus muscle to be drawn aside from the anteromedial surface. This allowed most of the proximal third of the tibia to be exposed without the slightest surgical injury, and the periosteum directly irradiated.

RESULTS OF OPERATIONS

At the end of two weeks, as in previous studies, the animals were sacrificed and examined, except in two cases which were examined immediately after operation.

No changes of any kind were seen in the abdominal viscera, or—in the leg operations—in the muscles, arteries, veins, nerves, or periosteum. No gross or microscopic differences were observed in comparison with controls which had been subjected to the same operations but without irradiation. There was no functional impairment observable, and no difference in the rate and quality of healing.

PROTECTION OF PATIENT

It must be remembered that while wavelength 2537A is germicidally very active, it is not a deep penetrant, and even its germicidal power can be prevented by very thin layers of certain interfering substances. Surface cells, however, can certainly be injured by overexposure. For that reason it would seem desirable to minimize field irradiation in lengthy operations, especially on visceral tissues. The production of histamine by ultraviolet stimulation might conceivably be of practical importance, and deserves further study.

The only references which the writer has been able to find as to field irradiation in neurosurgery are very limited and unsatisfactory, nor has he been able to find any neurosurgeon who approves of field irradiation.

PROTECTION OF OPERATING STAFF

The old method of exposing both the patient and the operating team to direct irradiation from an overhead octagon of ultraviolet tubes is now a thing of the past, and has been replaced by indirect or stratum irradiation of the upper and lower levels of the operating room air, specifically at least seven feet above the floor for the upper fixtures and not above three feet from the floor for the lower fixtures.

Indirect ceiling suspension fixtures, and wall bracket types which send all radiation upward or up-and-down with baffle are now in use in operating rooms in Canada and the United States. It may also be desirable in some cases to have barrier fixtures installed above doors.

The large electric companies manufacturing ultraviolet equipment give clear and emphatic warnings as to protection of the eyes of the operating staff from ultraviolet reflection. Reflective ceilings and walls can send back enough radiation to cause irritation of the eyes. The degree of such risk can only be determined by the use of an ultraviolet reflectivity meter in the hands of a thoroughly experienced lighting engineer, and it is urged that no installation be made without first calling in competent authorities to examine the operating room in question and make recommendations based upon that examination.

One company suggests that in some cases it might be desirable that all members of the operating staff who do not regularly wear corrective glasses be provided with plain glasses. This would give protection against ordinary amounts of reflection, and goggles would be unnecessary.

Field irradiation can be accomplished either by small hand-held irradiators, or by a portable type such as that designed by Watson and referred to in a previous paper. Glasses should be used, as there might possibly be some degree of reflection from instruments with broad surfaces, such as retractors.

Rules requiring the use of explosion-proof switches and lamps also govern ultraviolet equipment.

SUMMARY

1. Use of ultraviolet germicidal equipment in hospitals and other institutions is widely increasing.

2. The results of further experimental operations to test the safety of field irradiation are reported in condensed form.

3. Safety measures for the protection of the patient and operating staff are described and stressed.

I am greatly indebted to Mr. Fred Guth of the Edwin F. Guth Company of Saint Louis for the use of a Guth direct irradiator and for helpful descriptive material; to Dr. L. J. Buttolph of the Ultraviolet Radiation Division of the General Electric Company at Nela Park, Cleveland, Ohio, for very valuable and comprehensive information, and to Mr. J. A. Hodges of the same company; to Professor C. D. MacDonald for help in installing ultraviolet equipment; to Dr. Ross Flemington and Dr. George J. Trueman for making these studies possible; to department staff assistants Alberta White and Barbara Shaw, and to my wife, for technical help.

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RÉSUMÉ

L'utilisation germicide des rayons ultra-violets est de plus en plus répandue dans les hôpitaux et diverses autres institutions. Les résultats d'opérations expérimentales destinées à tester le degré de protection du champ d'irradiation sont résumés, de même que sont décrites les mesures de protection mises en œuvre pour mettre à l'abri de tout danger les malades et le personnel de la salle d'operations. JEAN SAUCIER

THE PROGNOSIS IN CANCER*

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EXPERIENCE in treating more than 2,300 cancer patients during the ten year period from 1936 to 1945 inclusive, forms the basis of this paper. The patients have been treated on the Neoplastic Service, or in the Cancer Clinic operated by the staff of that service, in the Metropolitan General Hospital at Windsor. The former is an all inclusive service prepared to provide complete care to the cancer patient, and staffed by individuals particularly interested in cancer and representative of all the specialties. All hospitalized staff or indigent cancer patients are admitted directly to this service, rather than to the surgical or other regularly seen services. Patients on these other services found to have cancer are promptly transferred to the Neoplastic Service. The Clinic possesses the usual x-ray therapy equipment, a considerable quantity of radium element, and is in receipt of radon, or radium emanation from the Department of Health Laboratories in Toronto as required. The usual diagnostic and treatment instruments and appliances, peculiar to cancer work, are provided. Use is made of the contiguous roentgen diagnostic, cystoscopic, laboratory, and other standard hospital departments. By virtue of the various consultants, use may be made of any, or all of the facilities of either the clinic, or the indoor service for the treatment of private patients. Patients are accepted at the hospital only by reference from a medical practitioner.

At times one is confronted with skepticism that cancer can be cured; and it is quite true that on occasion, patients are seen with metastases ten, fifteen or even twenty years after apparently successful treatment of cancer, but these are rare and isolated instances. In our clinic, 38% of all patients seen with cancer were alive and seemingly well five or more years later.

Patients are classified as having been treated either for cure or palliation. The category is determined, not by what one might expect the result to be, but by the treatment procedure employed. All patients receiving a form of treatment constituting the very minimum which might reasonably be expected to ever cure their particular type of cancer, are classified as having been treated for cure, even though one knew perfectly well that in many instances cure was practically an impossibility; *e.g.*, any patient having a resection of stomach or bowel, or a radical mastectomy, is classified as having been treated for cure. Irradiation alone, whether administered by x-ray, radium, or both together, is also divided into palliative and curative dosages, *e.g.*, a seemingly curable, but for some offside reason, inoperable carcinoma of the breast may be treated solely by x-radiation, with considerably larger dosage than would be administered for palliative purposes, and such patients are classified as having been treated for cure. Similarly, all patients receiving the full recommended course of x-ray therapy and radium for carcinoma of the cervix, no matter what the stage of disease, are considered as treated for cure. With these criteria, 58% of our patients were treated for cure, and of these there is a net 69.4% five-year survival.

While I do not wish to minimize the seriousness of even skin cancers, we have all come to look upon them as being particularly amenable to treatment, and in order to present a more informative picture of the results of treatment of cancer, they will henceforth be excluded from the analysis. Eliminating skin cancer patients, we find an absolute five-year survival of 26.2%; 49% of our cancer patients, still excluding skin cases, were treated for cure, many by compromise methods dictated by circumstances, and a net 58% of these survived five years.

Having demonstrated that a not unreasonable number of patients with cancer can be kept living and well for five years, the usually accepted period of time called cure, it behooves us to study ways and means by which this number can be increased. The problem naturally divides into two parts; first, what can be done to lessen the 42% failures amongst the patients treated for cure; and second, why were 51% of the patients treated only for palliation?

Unlike many disease processes which have a natural tendency for spontaneous cure, the condition of the untreated cancer patient steadily worsens, and in no other disease is the outcome so directly dependent upon the manner of treatment selected, and individual per-

* Read at the Sixty-sixth Annual Meeting of the Ontario Medical Association, Toronto, May 22, 1946.

sonal care with meticulous attention to detail. While procedures may vary from year to year, and from one clinic to another, certain broad principles have gradually developed in the treatment of each of the various forms of this disease. Every patient, however, must be considered as an individual problem and given careful study. An adequate plan of treatment must be worked out and instigated. Painstaking care and observation of the clinical condition of the patient must be exercised throughout, and where necessary, modifications of the plan of treatment must be introduced. No relaxation of vigilance can be permitted, even on conclusion of the active treatment. It is also our responsibility to keep watch over the future progress of the patient, and this should be done at frequent and regular intervals for a period of many years. We ask patients to return in one month, and give them definite appointments for this purpose. They are seen again at intervals of from one to three months for the first year, and usually every three months during the second year, and seldom is the interval greater than six months thereafter. Patients are cautioned to report immediately should any untoward symptom develop, rather than to await the next appointment. Careful recall files are maintained, and it is our responsibility to contact the patient, should the latter fail to keep his appointment.

The physician who undertakes the treatment of a cancer patient, assumes a very heavy responsibility. His patient's comfort and life are at stake. His conscience must be carefully searched to permit him to arrive at a conclusion as to whether or not he is in a position to offer his patient the best possible chance of survival, whether his results have been and can be expected to be the best possible, and whether he is willing to devote the necessary subsequent care and attention to the future outcome of his patient. Inadequate follow up examinations and the lack of a statistical analysis all too frequently prevent him from actually knowing what has happened to his cancer patients, and should he take time to investigate he is apt to find the results very much less hopeful than he had quite conscientiously believed to be the case. The physician who cannot, or will not fulfill these requirements, has no moral right to assume the treatment of such a lethal disease, and should immediately refer the patient to someone who is in a position to do so.

While those of us who devote most of our time to cancer work see many patients who have had the best of care, others come to us after inadequate, and at times inadvisedly performed treatment, which is not infrequently irremediable. Cancer of the breast offers a good example. Not infrequently a lump is removed, or worse still, cut into, and a piece only removed, and sent off somewhere for section, and this happens even in hospitals equipped with adequate pathological service and prepared for quick section, and a diagnosis is not made for three, four or six days. Failure to proceed with proper treatment immediately in these cases is often disastrous. Again, while patients frequently come to the clinic after having had a thorough and properly performed radical mastectomy, we do all too frequently see patients who have had very little, if any more than the simplest of local mastectomies masquerading under the title of a radical operation. In our own clinic 61% of the patients on whom I have done a radical mastectomy lived free from evidence of cancer for five or more years; whereas of those who came to us for x-ray therapy after having been operated upon elsewhere 35.7% survived for a similar period, and if we exclude the patients of a small group of the more painstaking surgeons, we find 23% living; results little short of terrible indeed. Careful study reveals no change in the stage of disease in these groups and the results can only be interpreted as indicative of the calibre of the operations performed.

As you are aware, surgery, x-ray and radium are the only agents which have as yet successfully cured cancer. Each has its definite field of usefulness and they should be regarded as complemental rather than antagonistic procedures. One can to advantage frequently combine two, or even all three of these agents, and rarely does one see a cancer patient who would not at some stage of his disease be benefited by such a combination.

Cancer of the fundus uteri provides a good example of the efficacy of the combined treatment. Adequate surgery has in outstanding clinics resulted in an approximate 60% five-year survival. Radium without operation salvages about the same number of the

operable cases; but when radium is followed by hysterectomy 75% survive.[1] For best results, however, consideration must be given to the histological grading of the tumour. The highly malignant, totally anaplastic grade 4 tumours are seldom, if ever, cured by surgery and should be treated solely by intrauterine radium and heavy external x-radiation. At the other extreme of malignancy, grade 1 tumours should be readily curable by operation alone. Best results in grade 2 and 3 tumours are obtained by the use of preoperative radium and panhysterectomy. Unfortunately, many of these patients are obese, elderly individuals and poor operative risks, and these, if deemed inoperable, are treated by x-ray, alone if for palliation, or in conjunction with radium if feasible and free from obvious metastases.

The routine practice in our clinic with carcinoma of the fundus is to fill the uterine cavity with radium at the time of diagnostic curettage. This is left *in situ* a sufficient length of time, usually 40 hours to deliver 4,000 milligram hours; during this interval a careful microscopic study of the tumour is made and its grade of malignancy determined. Panhysterectomy including removal of the entire fundus and cervix along with bilateral salpingo-oöphorectomy is done six weeks later on all operable patients with grades 1, 2 and 3 tumours and 87% of our patients survived free from evidence of growth for five or more years. Inoperable cases and those with totally anaplastic stage 4 tumours are started immediately after the radium treatment with a full pelvic cycle of high voltage x-radiation, administered at long skin target distances to insure the maximum penetration and given through 6 pelvic portals to the limit of tolerance, usually 2,000 r measured in air to each portal; 27% of these inoperable cases remain well five years later. Combined, the two groups show a 52% survival of all patients seen with carcinoma of the fundus. We have no operable cases treated by irradiation alone.

Proper selection of treatment procedure, and integration when advisable of all those facilities at our disposal for the treatment of cancer will, in the hands of the careful physician, who is entirely familiar with the disease he is about to treat, bring about a gratifying increase in the number of living patients. It is only fair to state, however, that we work under tremendous, and what frequently seem to me, unreasonable handicaps. We have for example treated in our clinic 235 patients for cancer of the cervix; 41% of 86 seen five or more years ago are alive and well, despite the fact that these women delayed seeking treatment for an average period of eight months after their first symptom, most commonly recognized as unusual bleeding. Breaking these down by extent of disease, we find that the average stage 1 patient delayed 5½ months, and 82% of this group survived, while only 10% of the stage 4 patients lived after dallying for an average of 16 months (Table I). The average breast cancer patient discovered her lump 16 months before seeking treatment.

TABLE I.

CARCINOMA OF THE CERVIX
INFLUENCE OF DELAY IN SEEKING TREATMENT UPON STAGE OF DISEASE AND PROGNOSIS

Stage of disease	*Average number of months delay in seeking treatment*	*Net 5 year survivals*		
		No. of cases	*Alive*	*%*
I	5½	11	9	(82)
II	6	27	18	67
III	12	30	6	20
IV	16	10	1	(10)
All stages	8	78	34	44*

*Three patients died before treatment could be completed, 4 others were deemed unfit for complete treatment. Excluding 3 patients who subsequently died of intercurrent disease, free from evidence of cancer, 34 of 71 patients given the full recommended course of x-ray and radium therapy lived 5 or more years—48%.

Rates based on fewer than 15 cases are bracketed.

While freely acknowledging that the stage in which we find a cancer is also dependent upon many other factors, such as the virulence of the growth, and the age of the patient, delay in seeking proper treatment is a very important consideration in the advancement and consequent lessened curability of the growth. While there may be very little hope of sufficient immediate education of the masses to bring about a major degree of improvement in cancer curability by this means, the fact remains that for the individual sufficiently concerned and well informed to act promptly on symptoms which would to most of us appear alarming, the present day chances of survival are good in at least the group being treated for cure.

We now come to a study of the 51% of patients, skin excluded, admitted in a condition fit only for palliation. Unsuccessful treatment elsewhere with recurrence of the growth accounted for 25% of the patients treated palliatively and the results obtained in treating

recurrent cases have no influence upon the prognosis which one can offer a new patient presenting himself for treatment for the first time. In another 14%, delay in seeking treatment for an easily recognizable and in its earlier stages entirely curable lesion was unquestionably the cause of the advanced stage of the disease. An additional 11% had easily recognizable tumours, in sites accessible for cure, and procrastination can be considered as the most probable cause for the patient's state when admitted. The remaining 50% had growths in sites admittedly difficult to recognize early or treat successfully, but at least some of these should have arrived in a condition worthy of an attempt at cure. We find then that 80% of cancer patients should be treated for cure with predictable success in 75 to 80% of these individuals. No more than 20% of cancer should be considered hopeless at this time, and in need of more effective treatment than is now available.

The patients were largely, but not entirely, responsible for this loss of time before the institution of treatment. In studies of 218 of our patients[2, 3] we found that 44% were referred for treatment within 1 week of first medical consultation; 22% in from 1 to 4 weeks, 13% in from 1 to 3 months, 10% in 3 to 6 months, 5% in 6 to 9 months, 3% 9 to 12 months and 3% in from 1 to 2 years. Failure to heed medical advice as exemplified by the fact that we occasionally see patients 6 months and even 2 or 3 years after being so recommended by their physician accounts for a small part of this delay, but we must nevertheless face the fact the 34% of patients lost 1 or more months of valuable time after first seeking medical consultation.

We hear a good deal about cancer diagnostic clinics, and are apt to visualize these as filled with elaborate and expensive equipment. The diagnosis of cancer can in most instances be made in any doctor's office. Three hundred new cancer patients were admitted to our clinic last year; the diagnosis of cancer was made in 254 of these by sight or touch alone, subject only to verification by biopsy and laboratory examination; x-ray, cystoscopic or other special examination was required in only 46 instances to make a diagnosis, usually suspected from the history obtained. Daily experience shows that it is an error to suppose that this diagnosis is usually difficult or expensive to make. The suspicion at least should exist and confirmation can usually be obtained by consultation with someone completely familiar with the disease or by a biopsy. Mistakes are commonly made through carelessness and hurried and incomplete examination rather than through lack of facilities.

We have recently asked 100 consecutive cancer patients why they did not seek earlier treatment. It is a popular fallacy to attribute this reticence on the part of the patient to fear of the expense involved. In 4 instances only was expense named as a cause for the delay and even these patients coupled this with an admitted fear of the truth or its consequences. Carelessness and ignorance predominate as shown in such answers as "I thought it was nothing to worry about and would disappear", "it wasn't sore", and "too busy". Fear of the diagnosis or possible operation or other necessary treatment deter a large number of patients; 23 reported without delay; 17 had been under their doctor's care, usually but not always, for an obscure condition. It is perhaps a pity that the files of a cancer clinic are confidential. The record of our profession is gratifyingly high; no one is above an occasional error. The habitual defaulters are few in number, but their score is so low, and their names appear with such monotonous regularity that they become well known to the staff.

Our experience in dealing with cancer of the rectum, and this of course is more or less typical of that of any clinic, is informative in that it illustrates the progress which has been made in the past decade, and warrants a good deal of optimism, not only for this but many other varieties of cancer.

In the eight years prior to 1935, 11 patients were admitted to the Metropolitan General Hospital, Windsor, with cancer of the rectum. In only 1 case, or 9%, was the growth resected, and this in a manner which would today be considered inadequate. This very small number of admissions indicates that most patients of that time were advised against operation as a useless procedure, and were not even hospitalized. During the first eight years of the clinic's operation, an equal period of time, 87 patients with cancer of the rectum were admitted and an additional 47 patients have

been admitted during the past two and one-half years.

The criteria of operability has undergone a decided change. In the early days of the service many advanced cases were seen, but from 1936 to 1939, 40% of the patients were radically operated upon, after this the resectability rate rose to 60% and in the last two years 84% of these patients had a resection and 87% were treated for cure. Unfortunately, there has been very little tendency on the part of the patient to seek earlier treatment, but there has been a more definite willingness on his part to submit to operation.

The risk involved in this operation today is not a factor of paramount importance. Any discussion of operative mortality without consideration of the surgeon's operability rate is incomplete; a high operability rate, indicative of the inclusion of advanced, poor risk, and elderly patients, justifiably carries a higher operative mortality than in a series of low operability rate. There has nevertheless in our group been a decline in the operative mortality from 40% originally to one of 3% in the past two years despite the rise in operability from 40 to 84%.

Even as a palliative procedure the operation is justified. There can be no question in the mind of any one familiar with this disease, that the relief from pain and tenesmus coincident with removal of the primary tumour is such that one should give the patient this benefit, even though he may have small liver or other metastases. The fact though, that 58% of the patients on whom resection has been performed are alive and well at the end of five years is the real encouragement.

Methods also have changed. Originally we preferred a two-stage operation; the resection is now almost invariably completed in a single session. We believe that the diminution in infection brought about by a short preliminary course of x-ray therapy obviates part of the advantage to be obtained by a two-stage operation, but even more important is its value in the case on the borderline of inoperability, in which we on occasions use a bit of radium in a doubtful area at the time of operation. There has recently also been a tendency towards preservation of the anal sphincter, and restoration of continuity, with abolition of the colostomy, but this should be mentioned only with a word of caution. Such an operation is unquestionably less radical than the classical abdominoperineal resection,[4] and its advocates having yet failed to demonstrate as satisfactory survival rates as by abdominoperineal resection, one should not lose sight of the fact that the real purpose in operating is to cure the patient.

There is still too much confusion in the minds of both patient and physician between the troubles of the individual who has a palliative colostomy, and the experiences of the patient whose growth has been removed. The former, still suffering all the discomforts of an unremoved cancer, naturally places responsibility for his difficulties upon his colostomy. The entirely different experiences of the patient from whom the growth has been removed show the error in this judgment. Careful enquiry of our entire group of patients who have permanent abdominal colostomies following abdominoperineal resections, revealed that these persons are carrying on useful and practically unrestricted lives. They have very little, if any difficulty with their colostomies, wear no appliances other than a small square of gauze to protect their clothing from mucus or accidental discharge, eat practically normal diets, and without exception are prepared to recommend this operation to anyone having a cancer in the rectum. It should be pointed out also that the obvious advantages to the patient of restoration of continuity and abolition of the colostomy are apt to become serious disadvantages should he be unlucky enough to have a recurrence of his growth. All told, I believe there is a very real place for this modification of the operation, but that it should be looked upon as a reward to the patient who heeds his symptoms and seeks aid at an earlier stage of his disease than do many of our patients at this time.

To recapitulate, with practically no more risk than any other abdominal operation, we now operate upon and resect 84% of the cancers of the rectum instead of the 9% done ten years ago. An additional 3% are treated by radical irradiation. With little or no ultimate discomfort to the patient, we offer him a 58% chance of cure, which would rise to at least 80%, if he would use only reasonable intelligence in response to his alarming symptoms.

The same story of progress, with only minor variations, could be repeated for a large majority of the commoner varieties of cancer.

SUMMARY

1. Thirty-eight per cent of all patients seen with cancer have survived, seemingly well for five or more years.

2. Methods for improving results are discussed. The responsibility in accepting a patient for treatment of cancer is heavy. Competent management of the case, selection of the proper method of treatment, and an endeavour to educate the public to seek treatment earlier are well worth while.

3. Delay on the part of the patient is not brought about by financial consideration but through ignorance, procrastination or fear of the truth or its consequences.

4. The medical profession, while most frequently alert to the situation, has shown itself responsible for a significant part of this delay.

5. Eighty per cent of cancer patients should be treated for cure and 75 to 80% of these could be cured.

6. The change in attitude towards cancer of the rectum over a ten-year period as outlined, can be applied to many other varieties of cancer.

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RÉSUMÉ

Les statistiques démontrent que 38% de tous les malades observés pour cancer ont survécu, apparemment en bonne santé relative pendant 5 ans et davantage. Les moyens d'améliorer cette statistique sont discutés. Ce n'est pas une mince responsabilité que d'accepter de traiter un cancéreux. On recommande, de toute évidence, de confier ces cas à des mains compétentes, de choisir le mode de traitement le plus efficace et d'éduquer le public sur l'importance d'une thérapeutique précoce. Les malades qui tardent à se faire traiter le font moins par embarras pécuniaires que par ignorance, négligence ou crainte de connaître la vérité. La profession médicale, pourtant constamment sur le qui-vive à propos du cancer est cependant responsable d'une part importante de ces retards. On estime que 80% des cancéreux devraient être traités et que de 75 à 80% de ceux-ci devraient guérir. Le changement d'attitude à l'égard du cancer du rectum au cours des 10 dernières années est souligné. Ce changement d'attitude peut s'entendre de plusieurs variétés de cancer. JEAN SAUCIER

THE ROLE OF THE EMOTIONS IN THE PRODUCTION OF GASTRO-INTESTINAL DISTURBANCES*

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THE human gastro-intestinal tract is richly endowed with autonomic nervous control, perhaps more generously than any other portion of the anatomy. It is not surprising therefore, that it is the most fertile field for symptoms which have emotional causes and correlations. This fact in varying degrees has been recognized in and outside of the healing profession since the dawn of human time. No other function of the body plays a greater part in the emotional life of a person from infancy on than does the taking of food. Satisfaction of hunger cravings is deeply ingrained and forms an essential part of our early conditioning and is intimately associated with feelings of somatic well-being and of being loved and wanted. To the healthy and happy infant, feeding and loving are inseparable. By the time adult life is reached and emancipation from childhood dependency achieved, there has been a modification or sublimation of this relationship which latter is not compatible with easy self-reliance and independence.

Alexander[1] deals with his gastro-intestinal cases of emotional origin under three groupings: first, a wide range of patients, from those with minor gastric symptoms such as epigastric distress, nausea, belching, heartburn, etc., to those with actual peptic ulcer. The second group have the predominant symptom of diarrhœa and are commonly diagnosed mucous or spastic colitis, with painful cramps and anxious evacuations, alternating with constipation. The third group have chronic constipation as the predominant symptom.

This grouping has much to recommend it but I must confess a limited experience in dealing with the last two groups, at least from the psychosomatic approach. Whether or not we agree with or even understand Alexander's psycho-analytic concepts, it must be admitted he has made a worth-while contribution to the deeper understanding of these baffling mys-

* Read at the Seventy-seventh Annual Meeting of the Canadian Medical Association, Section of Psychiatry, Banff, Alberta, June 14, 1946.

teries, which in our ignorance we lightly dismiss under such meaningless terms as "neurogenic". Alexander suggests that we try to understand the emotional attitude of the individual to his environment in terms of three tendencies: (1) to receive or take, (2) to retain, and (3) to give; and he believes that if the normal channels of emotional expression are blocked by inner conflicts, the gastro-intestinal tract may become the regular channel of their expression.

The first group, the gastro-duodenal one, is said to have deep seated urges in the direction of a dependent-receptive rôle, which the patient attempts to deny or reject, (I might add resent), and the denial takes the form, usually of over-compensation, over-striving, and going all out in the direction of independence and self-sufficiency. Others of the same discipline as Alexander have since, or have more recently, identified the dependency urge as a maternal attachment, which is being denied by the patient or frustrated by circumstances, the latter forming the precipitating cause for the onset or recurrence of symptoms. The maternal dependency theory may provide some explanation why gastro-duodenal disturbances are mostly exhibited in males.

In the second group there is the same deep-seated dependency conflict which is also denied, but it finds expression through painful evacuations which represent symbolically a two-fold effort, to make restitution, and to express aggressive and even sadistic tendencies.

In the third group with constipation of psychic origin, the symptom represents a rejection of an obligation to give, and is frequently associated in the same individual with tendencies towards thrift and even stinginess.

These are not necessarily my views, but I am inclined to give them prominence because I am in agreement with Alexander to a large extent in relation to the first group, which is the only one to which I have given special study. Much can be learned about emotional effects in relation to all psychosomatic conditions involving the gastro-intestinal tract, by giving particular attention to the group which includes conditions commonly referred to as "gastric neurosis" or "functional dyspepsia", and peptic ulcer. It will be noticed that I put them in the same group. I go a step further and claim that there is a fairly close kinship between peptic ulcer and psychoneurosis-anxiety type. Being convinced of this kinship as a result of the study of the emotional lives and backgrounds of numerous cases of peptic ulcer over a period of many years, I wondered whether there might be proof of this in Service statistics. An opportunity came last winter through the kindly co-operation of the Statistical Division of the Department of National Defence (Army), which on request, provided me with the raw figures for admissions to hospital by months from the beginning of the war of two morbidity groups, peptic ulcer and psychoneurosis-anxiety type. The accompanying chart includes only admissions to hospitals in Canada, but of course from a certain date there is an admixture of cases from overseas after return to Canada. The overseas story has been omitted because of some obvious distortions which largely represent policy distinctions in the use of certain diagnostic terms. These distortions are unfortunate because otherwise there seems good reason to believe that once the fighting began and frustration of that type ended, the incidence of peptic ulcer dropped, whereas anxiety neurosis in relation to external causes for fear, increased.

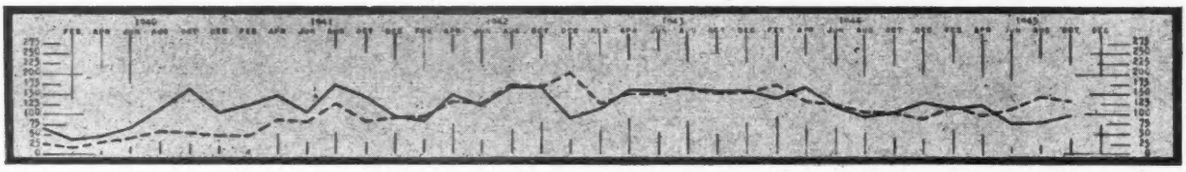

Chart 1.—The broken line represents psychoneurosis, anxiety type; the solid line gastric and duodenal ulcer.

It will be seen that there is an amazing parallelism in the hospitalization incidence of peptic ulcer and anxiety neurosis. Perhaps I can throw some light on the parallelism by outlining briefly some observations made by myself and departmental colleagues in relation to these two groups:

1. We frequently see frank anxiety neurosis and peptic ulcer in the same patient, either concurrently, sequentially, or reversely.

2. A family pattern of anxiety and tension may express itself in different members of the family as anxiety neurosis or peptic ulcer, or some other variant with which we are not at the moment concerned. The determinants are not very clear, why one has ulcers or gastric symptoms of the neurosis type, and another frank anxiety neurosis. At any rate it is my belief that no case of anxiety neurosis has been completely studied unless there has been careful enquiry into the possibility of a family pattern of anxiety, which should include enquiries regarding "stomach symptoms" and ulcer; vice versa similar enquiries should be made regarding anxiety states in parents and siblings in cases of peptic ulcer.

3. Our studies of the emotional background of ulcer cases suggest a close relationship between the psychic mechanisms of these and of ordinary cases of anxiety neurosis. I have yet to see a frank ulcer case even one in which there is a good life adjustment (according to ordinary standards and appearances) without being able to uncover with fair ease an insecure looking childhood background plus some disturbing concern in relation to the immediate life situation. So far as my experience goes the emotional life histories of my ulcer and of my anxiety neurosis cases are interchangeable, but of course I have not delved as deeply into the basic mechanisms as has Alexander and others. However, I believe that we can stop short of using deep psychoanalytic techniques and yet do an effective and constructive job in both peptic ulcer and anxiety neurosis.

I believe further that no case of peptic ulcer is being adequately treated, except perhaps in relation to the immediate digestive upset, without a study of the unhealthy emotional background. Whether that study requires the help of a psychiatrist depends largely on the insight of our colleagues in other branches of the profession and the care that they devote to the emotional portion of the life history.

4. Recent studies indicate that there are some electro-encephalographic and personality correlations between peptic ulcer and anxiety neurosis. Rubin and Bowman[2] find a dominant alpha rhythm 3½ times as frequently in the ulcer as in a control group. Previous studies by Saul and Davis correlated dominant alpha records with personality types such as found in ulcer and anxiety cases.

In a group of peptic ulcer cases on the service of Dr. Lawrence Brown, Veterans' Pavilion, Ottawa, our psychological studies with the Rorschach test have suggested a rather uniform response, which superficially resembles a schizophrenic one, but unfortunately we have had to discount the results as some of the cases at the time of testing were on insulin treatment.

The remarkable studies of Wolf and Wolff[3] and by Wolff and associates[4] have established beyond doubt that certain specific emotions such as anxiety, resentment, and anger were almost always accompanied by an increased secretion of hydrochloric acid and pepsin, and by some other autonomic phenomena. These reactions were observed in subjects with or without ulcer, but in the ulcer patients pain often developed as well, and the autonomic changes on the whole were greater. When feelings of assurance were induced gastric function returned to normal. In one special subject with a gastric stoma, anger or resentment produced a turgescence of the gastric mucosa and an apparent vulnerability to minor injury, which otherwise had little effect.

We have observed many cases in which it has been possible to show a close-up sequence between emotional stress and gastric symptoms. Dr. Robert Laidlaw has an interesting case that illustrates this immediate sequence as well as some other points.

R., aged 29, was repatriated from overseas in 1945 on account of duodenal ulcer confirmed by x-ray on admission to the Veterans' Pavilion, Ottawa. This man volunteered to Dr. Laidlaw after psychological testing that he had a return of some of his symptoms during the performance of the Minnesota Multiphasic Personality Inventory, "Well, there were some questions I didn't know how to answer. Yes, I guess you are right when you say a fellow can't make a decision. Anyway I couldn't make a decision about some of those cards and I found my hands got wet and the pain in my stomach come back on me".

This case not only shows a close time sequence between a specific frustration and a recurrence of gastric and autonomic symptoms but it serves to illustrate that in ulcer cases there is a striking lability of the autonomic reflex in response to minor psychic stress. Psychiatrists are more attentive to such influences than to the usual problems of hyperacidity and of dietary and other restrictions which preoccupy our colleagues in other branches of the profession. In fact we believe that imposed cautions and restrictions tend to

create their own somatic tensions in these labile cases.

This patient exhibited other significant features; he had Grade 7 only, was very conscious of his educational defects and was constantly striving to improve his manners and speech. He has always regretted since having to leave school at twelve to help his parents. The regret amounts to resentment, and although he is a very dutiful son and unusually devoted to his parents he has always resented the fact that as the single son the responsibility for his parents, who are frequently ill and dependent, devolved on him and was shirked by the five brothers who also dodged military service, most of them by medical rejection. Although he has had habits of worrying most of his life, it was worry over his parents' health while he was overseas that precipitated the onset of dyspepsia, that and a conflict situation in relation to his girl friend back in Canada.

He has had ideas of marriage but that had to be postponed until his parents were better situated. In any case, and this is the burning frustration, the girl's mother will not listen to marriage; she thinks he is uncouth and not good enough for her daughter. In a long interview he revealed fairly intimate details of his emotional history and that of his parents and siblings, but said nothing whatever about the matter that was giving him deepest concern, until he was on the point of leaving. In the meantime he readily revealed many neurotic traits in childhood, fear of the dark to age 20, enuresis, nightmares, and train sickness; told of his father having suffered from "stomach ulcers" until operation in 1938. Two brothers were rejected for Service on account of "stomach ulcers". One other brother has "digestive complaints", and another has a vile temper and they dare not cross him. Only one brother and sister are regarded as well. Another sister has "stomach trouble, worries a lot and is very nervous". The mother has always been a worrier and was afraid to let the boys out of her sight.

The most frequent combination of emotional factors in our cases seems to be "mother a worrier" and the patient himself with a background of insecurity or resentment and some immediate cause for concern or frustration. In my experience resentment is the highest common factor. This seems difficult to believe or accept in the face of a calm exterior and a good-looking life adjustment. Resentment is cheap in these days when everybody has his own pet hate, but I refer particularly to deep seated resentments, those which represent displacement of anxiety or replacement for frustration. It is a safe rule that hostility is present in everyone who has inner anxiety or feels threatened.

Resentment-producing conflicts are enhanced in peptic ulcer by reason of the fact that the emotions are held in check and rarely permitted free expression. These patients need to warm up rather than burn up. People who readily externalize their emotional tensions are unlikely to harbour deep resentment or to develop an ulcer. Because of the emotions being blocked from outward expression it is likely that day to day irritations, increased by reason of sensitization in childhood, find expression only in inner tensions with resulting interference with the proper functioning of the gastro-intestinal tract. Beneath a placid unemotional exterior there is often a seething struggle and the battle ground is the ulcer bearing area.

An individual may not be fully aware of his tensions or his worries. It is not necessary that the emotions or concerns be perceived in consciousness, to cause a disturbance in the function of the internal organs. This is shown in cases of ulcer with increased night secretion often in association with disturbed dreams and restlessness.

Psychiatrically speaking, there is apparently no great difference between peptic ulcer and gastric neurosis except that the latter has a more heavily laden background of childhood conflict and neurotic traits, and in addition, increased somatic concern and awareness. The life adjustment is more faulty than in the ulcer case, and the attempts to overcome the dependency urge are more feeble. It is not surprising therefore that hospitalization or too great protection from economic stress must often prove fatal to rehabilitation in functional dyspepsia.

The subject of this paper would seem to exclude any reference to treatment but in any case in which there are important emotional components, treatment is indissolubly intermixed with the clinical interview. It should begin with the initial greeting and continue throughout the unfolding of the emotional history. An unhurried interview with few of the trappings of professional approach, is essential. It is of no use asking the ulcer patient whether he has worries, actually that is considered a poor approach to any case. One should expect and deserves to get a negative reply to that style of questioning.

In addition to the therapeutic style of history taking, it is essential that the physician reflect confidence and avoid sensitizing the autonomic reflex further by imposing too many cautions and restrictions and insisting on too many procedures and rechecks. Dr. Laidlaw and I have handled several cases with apparent success to date by first clearing up the conflict material and frustrations, after which caution is thrown to the winds by putting the patient

on full diet without medication and allowing him to be up and around. It might seem preferable and logical to omit certain items and roughage from the diet. It might seem advantageous that tobacco, coffee and condiments be omitted or forbidden, and that the patient spend the first week or two in bed, but as in dealing with our frank psychiatric patients, we have come to the conclusion that, where we gain in one respect by cautions and restrictions, we lose in another. I do not think that the average ulcer case takes kindly to restrictions; even if he is consciously tolerant of them, he is not so unconsciously, and this is reflected through the labile autonomic control. Medication can be a crutch and as such I believe the patient takes too kindly to it, depending upon it for immediate relief and for control of symptoms which he can be taught to deal with in other ways.

If facilities permit group psychotherapy should be used, but never as a complete substitute for individual exploration and therapy. Group talks should consist of simple diagrammatic demonstrations of the anatomy and physiology of the gastro-intestinal tract, including the influence of emotions. It is well to assume that all peptic ulcer cases have a tendency to worry too much and to discuss and re-discuss their symptoms in the hospital and at home. Group talks should discourage any discussion of complaints outside of the class or the examining room and should provide instruction how to interrupt habits of worrying, the best method being to interpose pleasant thoughts, choosing for this purpose the happiest moment in the patient's life.

Peptic ulcer should be explained as a reversible condition, recovery from which depends a great deal on the patient's attitude. Besides controlling worry and avoiding discussion of symptoms, he can contribute much by learning how to laugh and relax and to succeed without striving. It is believed that prevention of further upsets can be achieved by the use of these methods.

To those who are curious but unbelieving regarding the essential emotional components of peptic ulcer, I would suggest a little experiment. Select one of your ulcer patients whom you do not know socially, invite him to your house and your den for a quiet informal evening chat. Tell him you have been listening to a fellow who has some funny ideas about the emotional background of ulcer. Tell him, if you like, that you are not quite convinced and then let him do the rest, provided that you give him the whole evening in which to extend himself. Don't do too much of the talking and have little to say by way of advice or admonition. You may, if necessary, put in prompting questions here and there regarding parents, brothers, and sisters, and how they are getting along; enquire about the wife and children and business, but avoid discussion of symptoms, certainly any elaboration of them. Rather let the conversation deal with worries, anxieties, frustrations and disappointments. If you sense resentment or hostility along the way, keep it in mind and bring the touchy subject up by itself later in the evening.

May I add a suggestion regarding the handling of deep resentment and hostility in any patient, because after all, these emotions are not confined to ulcer cases but are almost specific in certain other conditions in which they are perhaps no better understood than in ulcer, for instance in hypertension. Let us suppose that resentment is expressed against a parent; give it free rein for a while and perhaps give encouragement of other hostility ventilation. But free ventilation alone is not sufficient in dealing with hostility against someone who ordinarily should be loved and respected. Therefore, I usually wait till near the end of the interview and then ask sympathetically: "Tell me something about your father, what his background was, and what he had to put up with as a boy?" That sort of question enables you to close on a constructive and happy note.

One or two such off the record interviews will enable the patient to get a lot off his chest and relieve many of his inner tensions, but of more importance, will give you some insight into the psychic mechanisms of patients and their attitude towards all disease including psychosomatic conditions. You will now understand better why your patient in the atmosphere of the busy office replied in the negative to your question whether he had any worries.

SUMMARY

Emotional influences chiefly those reflecting deep seated conflicts have definite effects on the gastro-intestinal tract, even to the extent

of producing pathological changes as in peptic ulcer and special forms of diarrhœa and constipation.

There is a close kinship between anxiety neurosis and peptic ulcer, and between peptic ulcer and so called "gastric neurosis". Psychotherapeutic methods of dealing with anxiety neurosis are equally effective in peptic ulcer.

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RÉSUMÉ

Les émotions, notamment celles qui proviennent de conflits affectifs très refoulés, ont des effets très nets sur le tractus gastro-intestinal. Il est admis que celles-ci jouent un rôle important dans le genèse de certaines diarrhées et constipations et qu'elles vont jusqu'à provoquer l'éclosion d'états somatiques aussi sérieux que l'ulcère peptique. Il existe d'étroites relations entre la névrose d'angoisse et l'ulcère peptique d'une part, et entre l'ulcère peptique et la "névrose gastrique", d'autre part. La psychothérapie, dont le choix et la méthode varieront selon les préférences et tendances individuelles aura des résultats également efficaces, et dans la névrose d'angoisse, et dans l'ulcère peptique. Ces séances ne devront pas être précipitées et le thérapeute devra attacher une grande importance aux antécédents, personnels et héréditaires, du sujet, de même qu'à l'histoire détaillée de ses craintes, haines et frustrations.

JEAN SAUCIER

THE EFFECT OF BENZEDRINE ON MENTAL OR PHYSICAL FATIGUE IN SOLDIERS

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THE experiments described in this paper were carried out in the early part of 1942 when pressing calls on man-power necessitated the investigation of all possible methods of conserving energy in soldiers. Reports from enemy sources at that time revealed that analeptics were being used by German tank crews and other troops in North Africa. The Medical Research Council established a sub-committee on analeptic substances, under whose auspices a memorandum was issued in which all the available data on the use of benzedrine and methedrine in war was subjected to critical evaluation. The effect on muscular exercise was summarized as follows:

"Benzedrine (phenylisopropylamine) in certain doses and under certain conditions produces an increase in muscular output measurable in laboratory experiments. The action is due to temporary suspension of deterioration of output as fatigue sets in. The effect is probably obtained by making the subject less aware of muscular discomfort and general feelings of tiredness and not by any simple or direct action upon his muscular or physical powers. The effect commences about one hour after administration of the drug and lasts for one to three hours or somewhat longer. Benzedrine does not increase the efficiency of a fit and untired man nor is it apparently effective if complete exhaustion has already set in at the time of its administration."

More recently, investigations have been carried out in Scandinavia and Russia on the effect of benzedrine or pervitin (d-desoxyephedrine) on physical and mental efficiency in severely fatigued individuals,[1] in aviators,[2] and as an agent increasing working capacity during prolonged night vigils of military campaigns.[3]

Numerous reports in the literature support the view that benzedrine exerts a stimulative effect on the central nervous system, influencing mood, preventing mental fatigue, increasing the powers of concentration and inducing wakefulness.[4, 5] These factors, and especially the capacity of the drug to retard sleep, have been regarded as of possible use to soldiers in the field.

The experiments described in this paper were carried out to determine the effect of benzedrine on soldiers taking part in physically or mentally fatiguing exercises with special reference to the ability of the drug to allay fatigue and to prevent deterioration in military efficiency. For purposes of assessment, military efficiency was defined as "the capacity of a subject to complete a problem or exercise in a satisfactory manner".

In all these experiments, the substance used was benzedrine (amphetamine) sulphate.

THE EFFECT OF BENZEDRINE ON PHYSICAL FATIGUE IN SOLDIERS

Two separate experiments were carried out. In Experiment A, the performance times and the rifle-firing ability of two groups of 50 soldiers each were compared in the fresh state and after a fatiguing exercise. One hour before the end of this exercise the subjects of one of the groups took 15 mgm. of benzedrine each; the other group took an inert substance indistinguishable in appearance from benzedrine.

In Experiment B, three groups each of 50 soldiers participated in obstacle course and rifle-firing assessments in the fresh and fatigued

states. Two of the groups took benzedrine in divided doses totalling either 30 or 35 mgm. The third group took an inert substance identical in appearance with benzedrine. The performance times and rifle scores were analyzed statistically. Immediately after the experiment, each participating subject answered a questionnaire designed to find out his subjective reactions to the substance he took.

Test subjects.—The subjects in each experiment were non-commissioned officers and men drawn from an infantry battalion. The groups of 50 men were chosen so that the average age, height and weight of each group were as similar as possible. One or two officers, specially chosen for their quality of leadership, were attached to each group.

Prior to the experiments, the subjects underwent a period of training lasting in the first experiment for one week and in the second for three weeks. Training consisted of day and night marching; running; physical training; field craft; digging exercises; platoon and arms drill; obstacle course exercises; map reading and fundamental training which included numerous talks on the care of the feet. Several times each week all the subjects taking part in the first experiment went over an obstacle course similar to that used in the experiment. In the second experiment, rehearsals on the test obstacle course were carried out several times each day.

During the experiments, the subjects wore battle dress, webbing, steel helmets and carried rifles and bayonets.

Obstacle course.—In each experiment, the obstacle course consisted of a number of obstacles which were conventional in type, none of them calling for any special gymnastic or athletic ability. In the first experiment the course was 227 yards long and comprised 6 obstacles. The obstacle course in the second experiment was 500 yards long and comprised 9 obstacles.

The procedure of carrying out the obstacle course assessment differed slightly in each experiment. In Experiment A, the subjects were not allowed to undertake any practice runs over the course although from their previous training they were familiar with the types of obstacles which were included in the course. They were encouraged to put forth their maximum effort by various methods of motivation.

After a preliminary walk around the course, the subjects undertook the course and the times to complete the course from start to finish were noted. On completion of the fatiguing exercises the subjects were timed over the course again.

Within the week prior to the commencement of Experiment B, the subjects participated in several trial runs over the course so that when the first timed run took place, in the fresh state, the men were already well familiar with the course and the obstacles. Motivation was applied as in Experiment A with the addition of the promise of extra leave to all men who were taking part in the experiment. Two additional assessments were interposed in the course of the fatiguing exercise and a final assessment was made at the conclusion of the experiment.

Rifle firing assessment.—Immediately after each obstacle course assessment, the subjects proceeded to a specially constructed rifle range. In Experiment A, firing was from 4 numbered points with sandbag rests at a range of 100 yards. In groups of four, the subjects fired 10 rounds rapid fire, and scores were assessed so that the maximum possible score was 50. In Experiment B, the subjects in groups of six, fired a grouping practice of 5 rounds at 100 yards. The customary grouping scoring system was used; all 5 rounds had to be on the target to score and the maximum score was 25.

The fatiguing exercise.—In Experiment A, the fatiguing exercise lasted for just over 17 hours. During this time, the subjects took part in a tactical advance at the double over harrowed fields which were frozen and difficult to traverse, dug themselves in on an open hillside and marched a total distance of 40 miles. Twenty-six miles of the march were on smooth hard-surfaced roads and the remaining 14 miles on steep, narrow winding mountain paths which were frozen underfoot, making progress difficult. In the course of the fatiguing exercise, the subjects were allowed one hour's rest and ate one small meal. One hour before the exercise was scheduled to end, each subject was issued with a box containing 3 capsules. The capsules in half of the boxes contained 5 mgm. of benzedrine per capsule, those in the other half 5 mgm. of calcium lactate per capsule. The identity of the capsules was not revealed to either the subjects or the ad-

ministrative personnel of the experiment until its conclusion.

In Experiment B the fatiguing exercise lasted for 56 hours, and consisted of day and night marches over rough mountain paths as well as on gravel surfaced roads, "bushwhacking" through mountain woods and thickets, digging communication trenches, lectures, battle drill, attack exercises over rough brush, swamps and ploughed land and riding in trucks over rough uneven country. They marched a distance of over 50 miles, 32 of which were on gravel surfaced roads and the remaining distance of over 18 miles on rough mountain paths and through uncut underbrush. In addition, the subjects completed the obstacle course three times during the exercise. In the course of the 56 hour period of the exercise, the subjects were allowed divided rest periods totalling 7½ hours, but sleeping was not possible for more than 4½ hours of this time. On each of the 3 days of the exercise, the subjects were allowed one full meal and two additional light meals consisting of coffee and one or two sandwiches. Within the last 24 hours of the exercise, 5 issues of capsules were made to the subjects at different times, the last capsules being taken 2 hours before the final obstacle course and rifle firing assessments were made. The subjects did not know when the exercise was to conclude until the final obstacle course assessment was made. Within a twenty-two hour period, one group of 50 subjects took a total of 30 mgm. of benzedrine, a second group took 35 mgm. of benzedrine and a third group 35 mgm. of calcium lactate. As in Experiment A, the identity of the capsules was unknown to any of the persons taking part in the experiment until after its conclusion.

RESULTS

Experiment A

(*a*) *Objective results.*—The average times to complete the obstacle course by each group were as follows:

Group	*Average time to complete obstacle course*	
	Fresh state	*Fatigued state*
Control (50 subjects).....	166.9 secs.	162.1 secs.
Benzedrine group (48 subjects)	170.8 secs.	153.6 secs.

The ratios of the times taken to complete the obstacle course in the fresh state and in the fatigued state were calculated for each subject. The mean values and standard deviations of these ratios were:

Group	*Mean value of ratios of times for Fatigued state assessment / Fresh state assessment*
Control.....	0.988 = (σ = 0.111)
Benzedrine.....	0.942 = (σ = 0.236)

The chance that the observed difference in the means of these ratios could have resulted by random sampling from the same population as determined by "students" test was found to be 1 in 5. Such a chance represents a statistical significance below the normally accepted standard for tests of this type.

The figures for the rifle assessment were also analyzed and no statistically significant difference was found between the scores of the control and benzedrine groups.

(*b*) *Subjective results.*—The replies to three questions, which each subject was required to answer, were as follows:

Question: "Did you notice any effects after taking the tablets?"

Answers:

	Benzedrine group	*Control group*
Positive answer..	17—(35.4%)	6—(12.5%)
Negative answer.	31—(64.6%)	42—(87.5%)

Question: "How did you sleep last night?"

Answers:

	Benzedrine group	*Control group*
Well.....	38—(49.0%)	45—(90.0%)
Badly.....	10—(21.0%)	5—(10.0%)

(*a*) *Objective results.*—The average times to complete the obstacle course by each group were as follows:

Group	*Average time to complete obstacle course*			
	1st assessment	*2nd assessment*	*3rd assessment*	*4th assessment*
Control....	162.9 sec.	173.4 sec.	185.5 sec.	191.2 sec.
Benzedrine (30 mgm.)	163.9 "	168.9 "	178.9 "	182.7 "
Benzedrine (35 mgm.)	163.7 "	172.3 "	181.0 "	187.6 "
Benzedrine (combined groups)...	163.8 "	170.6 "	179.9 "	185.2 "

The ratios of the times over the obstacle course in the 2nd, 3rd, and 4th assessments, to that in the 1st (fresh state) assessment was selected as being indicative of a man's relative efficiency as the exercise progressed. These ratios were calculated for each man. The mean value and the standard deviation of these ratios for each group are tabulated below.

Group	Mean value of ratios of times for: 2nd assessment / 1st assessment	3rd assessment / 1st assessment	4th assessment / 1st assessment
Control.....	1.063 (σ=0.0635)	1.135 (σ=0.1085)	1.179 (σ=0.1160)
Benzedrine (30 mgm.).	1.031 (σ=0.0618)	1.095 (σ=0.0829)	1.120 (σ=0.1105)
Benzedrine (35 mgm.).	1.051 (σ=0.0582)	1.104 (σ=0.1080)	1.145 (σ=0.1180)
Benzedrine (combined groups)....	1.041 (σ=0.0607)	1.100 (σ=0.0958)	1.133 (σ=0.1140)

On applying "students" test for the significance of the difference of mean values of the above ratios, it was found that the chances that the two benzedrine groups (30 and 35 mgm.) could have been drawn by random sampling from the same population were 1 in 11, 1.5 and 3 in the 2nd, 3rd and 4th assessments respectively. It was therefore considered permissible to combine both benzedrine groups to form one group of 100 subjects. (Mean values and standard deviations of the above ratios for this combined group are presented in the above table.)

The combined benzedrine group was then compared with the control group. By testing for the significance of the differences of the mean values of the above ratios, it was found that the chances that these two groups could have arisen by random selection from the same population were 1 in 24, 23 in 45 and in the 2nd, 3rd and 4th assessments respectively. The significance of these chances is discussed below.

The rifle firing scores failed to show any statistically significant difference between the control and benzedrine groups.

(*b*) *Subjective results.*—The following information was obtained from a questionnaire which each subject was required to answer at the conclusion of the experiment.

	Benzedrine groups (30 mgm.)	Benzedrine groups (35 mgm.)	Control group 35 mgm. calcium lactate
Number of subjects who, at the end of the exercise, were:—	%	%	%
Very tired.....	49	38	52
Slightly tired.....	49	52	46
Not at all tired	2	10	2
Number of subjects who felt that they were:—			
Helped by the capsules.	85	77	66
Hindered by the capsules	4	2	4
Unaffected by the capsules.....	11	21	30

THE EFFECT OF BENZEDRINE ON MENTAL FATIGUE IN SOLDIERS

Test subjects.—The subjects used in this experiment were 3 officers in their last week of a Canadian War Staff Course. One-third of the officers had been serving in the active forces since the outbreak of the war in 1939 and the remainder had over 2 years' service. About four-fifths of the group had some staff experience in the junior grades such as staff learners or liaison officers in a field or static formation.

These subjects could not be categorized as staff officers at the time of investigation, as they were not then holding staff appointments. However, it was the opinion of responsible senior officers that, if these officers were employed at staff duties over a prolonged period, they would reproduce an approximately similar degree of mental fatigue to that of staff officers under the same circumstances.

The subjects were divided into 3 groups: one group of 25 subjects was issued with benzedrine as outlined under "procedure", a second group of 25 subjects was issued with an inert control substance (calcium lactate) and a third group of 23 subjects was untreated. The 3 groups were carefully chosen so that, as far as possible, each contained an equal number of subjects of outstanding, average, and poor ability. This classification was based on a system of grading compiled by the Directing Staff as a result of 4 months' knowledge of the students' capabilities.

While each of the subjects worked as an individual, for purposes of assessment they were grouped in 7 syndicates each consisting of 10 or 11 subjects. Each syndicate was under the direction of a General Staff Officer (G.S.O. II) who acted as adjudicator for his syndicate. The syndicates were so composed that the G.S.O. II was thoroughly familiar with the personality, capabilities and usual standard of work submitted by each member of his syndicate.

Procedure.—Over a period of 72 hours, the 73 subjects were required to complete a program consisting of 9 exercises in staff duties, some longer and more complex than others. The exercises were designed and the times for submitting so arranged that the subjects had to work hard to complete the various parts on time. Conferences were held on these exercises at frequent intervals and reports had to be

handed in at specified times over the test period of three days. All the written exercises were held in rooms with 10 to 11 subjects to a room. During the first 42 hours there was no opportunity for sleep. In the last 30 hours there were 2 periods, one of 6 hours and one of 4 hours, during which the subjects could leave the rooms and do as they wished on the understanding that the next report was handed in on time.

At intervals between the 32nd and 42nd hours, a number of capsules were issued to 50 of the subjects so that 25 of them got 20 mgm. of benzedrine each and 25 an inert substance (20 mgm. of calcium lactate). A similar dosage was issued between the 56th and 66th hours. The total amount of benzedrine issued to each man in the benzedrine group was 40 mgm. Twenty-three subjects were untreated. All the capsules were identical in appearance and no one participating in the experiment, either as subject or administrator, was aware which subject got benzedrine and which the control substance.

The results were assessed by adjudicating staff officers with a view to determining whether the military efficiency of each subject, as judged by the standard of his work, deteriorated, improved or remained unchanged with the progress of the experiment. Military efficiency was defined as "the ability of a subject to complete the staff problems set him in a satisfactory manner". To decide whether there had been any alteration in military efficiency, the work of each subject was compared with: (*a*) the standard to be expected from him as judged by his performance during the previous four months, and (*b*) the standard of work submitted by him in the earlier stages of this experiment.

In this respect attention was paid to factors such as method of expression, judgment, handwriting or typing, the behaviour of the subject at the conferences, his alertness, apathy, evidence of lack of judgment, etc. Throughout the experiment a continuous record was kept of the performance of each subject.

At the end of the experiment, in addition to an opinion as to the state of military efficiency, each adjudicator was required to give an estimate as to the degree of fatigue developed in each subject in his syndicate, and whether he had reason to conclude that the subject was affected by an analeptic or not. An accurate record of the amount of sleep taken by each subject throughout the trial was also required.

These observations comprised the objective part of the assessment. The more important of them were treated statistically and the final conclusions of the investigation were based on the result.

Subjective data were compiled from a questionnaire completed by each subject, 48 hours after the end of the experiment. On this, he was required to say whether he was severely fatigued by the exercise or not; whether he was aware of any effects after taking the capsules; if he considered they helped him or hindered him in his work; whether they had any effect on sleep and would he make use of them again under similar circumstances.

RESULTS

(*a*) *Objective results.*—(Observations made by the Adjudicators.)

Number of subjects whose military efficiency (capacity to complete problems set them in a satisfactory manner):	*Benzedrine group*	*Control group*	*Untreated group*
Improved during the experiment.....	1 (4.5%)	0	0
Remained unchanged during the experiment	11 (50.0%)	9 (43.0%)	4 (24.0%)
Deteriorated during the experiment.....	10 (45.5%)	12 (57.0%)	13 (76.0%)
Number in each group.	22	21	17

In compiling the above figures, only subjects whose standard was equal to that required of a Staff Officer were included.

Calculated on the assumption that the proportion of those whose military efficiency deteriorated during the experiment was unaffected by the taking of any capsules, the probability of results being obtained by random sampling such as those found in the benzedrine and the untreated groups, would be approximately 1 in 4. Therefore, it must be concluded that benzedrine had no effect in preventing deterioration of military efficiency under the conditions of this experiment.

Similarly, by random sampling there would be approximately an even chance of obtaining results such as those found in the benzedrine and control groups and the control and untreated groups.

	Benzedrine group	*Control group*	*Untreated group*
Number of subjects who during the entire experiment did not sleep. (These observations were made only on 4 syndicates, involving 42 subjects).....	7 (50%)	4 (27%)	3 (23%)

The probability of obtaining such results by random sampling would be: considering the benzedrine and untreated groups, approximately 1 in 4; considering the benzedrine and control groups approximately 1 in 3; considering the control and untreated groups, approximately even.

	Benzedrine group	*Control group*	*Untreated group*
Number of subjects who slept less than 3 hours or did not sleep at all. (These observations were made on only 42 subjects)	13 (47%)	9 (30%)	6 (23%)

The probability of obtaining such results by random sampling would be: considering the benzedrine and untreated groups, approximately 1 in 7; considering the benzedrine and control groups, approximately 1 in 3; considering the control and untreated groups, approximately even.

These probabilities represent a significance below that normally accepted for tests of this type. Therefore, it must be concluded that benzedrine, in the doses given, had no statistically significant effect in preventing sleep in the present experiment.

	Benzedrine group	*Control group*
Number of subjects in each group whose performance and appearance led the adjudicators to believe they had taken an analeptic	15 (60%)	8 (32%)
Number of subjects in each group who in the opinion of the adjudicators were *helped* by the capsules	14 (56%)	8 (32%)
Hindered by the capsules	1*	0

*Adjudicator's comment: "drug appeared to give false idea of capabilities and false optimism."

(*b*) *Subjective results.*—(Observations made by the subjects.)

	Benzedrine group	*Control group*
Number who felt they were *helped* by the capsules	21 (84%)	16 (64%)
Number who felt they were *hindered* by the capsules	1 (4%)	4 (16%)
Number who felt they were *unaffected* by the capsules	3 (12%)	5 (20%)
Number who believed that the capsules helped to keep them awake	21 (84%)	7 (28%)
Number who, if faced with *3 days continuous work*, would like to take similar capsules	19 (76%)	14 (56%)

None of the differences between the two groups is statistically significant.

DISCUSSION

The use of an obstacle course to assess the effects of benzedrine on progressive fatigue, because of the insensitivity of the method, can not be expected to give worthwhile information, unless there is a marked difference in the times returned by the two groups under test. In Experiment A, there was evidence that benzedrine produced any effect in allaying fatigue. However, it must be emphasized that both control and benzedrine groups showed improved performance times in the fatigued state. This apparent anomaly can be explained by the fact that the times returned in the fresh state assessment were abnormally long as a result of lack of familiarity with the course. The reduced times for the second assessment reflect the influence of the experience obtained in negotiating the course in the previous assessment, which was sufficient to offset the effect of fatigue on the performance times. In Experiment B, the subjects were familiarized with the obstacle course by several previous practice runs and other undesirable factors which might influence the performance time of the subjects, such as knowledge of the time at which the experiment was scheduled to end, were eliminated.

In biological experiments, it is usual to regard a chance of 1 in 100 as statistically significant, although sometimes a level as low as 1 in 20 is considered to be a threshold value. On this basis, the results of Experiment B, which indicated that the chances of the two groups being drawn by random sampling from the same population were 1 in 24, 23 in 45 in the 2nd, 3rd and 4th assessments respectively, suggest that benzedrine may have had some influence on the ability of the subjects to return better times over the obstacle course compared with a control group. However, the difference between the control and the benzedrine groups was not of a highly significant nature and from a practical standpoint, the relative improvement in time can be disregarded.

There was no evidence from the answers submitted by the subjects to the questionnaire in either experiment that any degree of wakefulness of practical importance was induced by benzedrine.

The observations of the effects of benzedrine on mental fatigue did not indicate that the drug had an influence in averting deterioration in military efficiency in the sense used in this experiment, that is, the capacity to complete a specific problem in a satisfactory manner. As in the experiments on physical fatigue, benze-

drine in the doses used, was not shown to prevent sleep in any appreciable degree.

Undesirable side effects of benzedrine have been reported by many investigators, the commonest being dizziness, headache, increased depression and lassitude, anxiety and tenseness, nervousness and irritability. Temporary confusion after 30 mgm. has been reported in normal subjects.[4] In this investigation, the adjudicators were instructed to note particularly any evidence of impairment of judgment which could not reasonably be attributed to fatigue. Only one instance of this nature was recorded. The adjudicator commented that the subject ". . . appeared to develop a false idea of his capabilities and false optimism . . .". There is some evidence however that this officer under normal conditions possessed an unstable judgment. The only untoward effects noted amongst the benzedrine group were palpitation, secondary depression (two cases), headache and "lightheadedness", feeling of "tightness around the head" and slight indigestion and intestinal discomfort. All those symptoms have been frequently noted before and in this experiment none of them was of any consequence. Several complaints of headache and depression were made by subjects in the control group. The main conclusion to be drawn from these observations is that under the conditions of this experiment, 40 mgm. of benzedrine given within a period of 34 hours had no deleterious effect on judgment, and any other side effects were trivial and of little consequence.

SUMMARY

Fifteen mgm. of benzedrine given to soldiers taking part in physically fatiguing exercises lasting for 17 hours did not enable them to return significantly better performance times over an obstacle course compared with soldiers treated with an inert control substance.

Thirty-five mgm. of benzedrine given in divided doses over a period of 24 hours to soldiers taking part in physically fatiguing exercises lasting for 56 hours did not enable them to show a worthwhile improvement in the times taken to negotiate an obstacle course compared with soldiers treated with an inert control substance.

Forty mgm. of benzedrine given in divided doses over a 34-hour period to officers taking part in staff problems lasting for 72 hours has no significant effect on military efficiency compared with officers who took an inert control substance or who were untreated.

There was no evidence in these experiments that benzedrine in the doses mentioned above tended to prevent sleep. No side effects of any significance were caused by these doses.

The findings of these three experiments did not warrant a recommendation that benzedrine should be provided to soldiers for the purpose of averting physical or mental fatigue.

Thanks are due to Dr. B. A. Griffith and Lieut. Reed H. Johnston who carried out the statistical analyses.

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RÉSUMÉ

L'administration de 15 mg. de benzédrine à des soldats soumis pendant 17 heures à des exercices fatigants ne leur permit pas de terminer plus rapidement une course à obstacles que les soldats témoins à qui l'on avait administré une poudre inerte. L'administration de 35 mg. de benzédrine à des soldats soumis pendant 24 heures à des exercices fatigants ne leur fit pas accomplir mieux et plus rapidement une course à obstacles que ceux à qui l'on ne donna qu'un simulacre de benzédrine. L'administration de 40 mg. de benzédrine, à doses fractionnées, pendant plus de 34 heures à des officiers participant à des problèmes d'état-major qui durèrent 72 heures n'eut pas d'effet appréciable si on les compare à ceux que l'on observa chez d'autres officiers qui ne recurent pas de benzédrine. Rien ne démontre au cours de ces expériences que la benzédrine a des effets antihypnotiques. Aucune réaction désagréable ne fut signalée. En somme, rien ne permet de recommander la benzédrine pour prévenir la fatigue physique et psychique des militaires. JEAN SAUCIER

CLINICAL OBSERVATIONS ON THE USE OF BENADRYL, A NEW ANTI-HISTAMINE COMPOUND

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BENADRYL (B-dimethylaminoethyl benzhydryl ether hydrochloride) is a fairly recently synthesized chemical compound possessing at least three significant pharmacological actions.

1. It relieves bronchial constriction caused by histamine or anaphylactic shock. E. R. Loew[1] and his associates have demonstrated that benadryl is from fifteen to thirty times as active as aminophylline in relieving bronchial constriction in histaminized guinea pigs. In a control group the untreated animals all died; with adequate doses of aminophylline the mor-

tality rate was 47%; with adequate doses of intraperitoneal benadryl the mortality rate was nil.

2. It alleviates spasm of smooth muscle. Studies on its anti-spasmodic action on smooth muscle revealed that it is 650 times more effective than papaverine in antagonizing histamine, 50 times more effective in antagonizing acetylcholine and 1.3 times more effective in antagonizing the contractile effects of barium chloride.

3. It decreases the vasodilator effect of histamine. McElin and Horton[2] have demonstrated this by producing a cutaneous blush on the face and upper chest by the continuous steady intravenous administration of a 1/250,000 solution of histamine. During the course of the histamine injection benadryl was administered in another vein. The blush reduced quickly and remained thus in spite of the continued administration of histamine. Further clinico-physiological studies by McElin and Horton[2] revealed that benadryl alleviated the nasal congestion artificially produced by histamine administration (vasodilation of mucous membrane). They have shown that it can decrease the acid response of gastric mucosa to histamine and that it can depress the wheal and flare response to cold sensitivity. Feinberg and Friedlander[3] have recently demonstrated its usefulness in abolishing complicating dermographism in skin testing.

To understand the rationale of benadryl therapy one must bring to mind the more important properties of histamine. It was in 1910 that Dale and Laidlaw[4] published their classic report on the physiological action of histamine. Code[5] has summarized the more important of these properties under the headings: site of action, effects produced and important organs affected.

TABLE I.

Site of action	*Effects produced*	*Important organs affected*
Smooth muscle	Contraction	Bronchiolar, intestinal, vascular and uterine smooth muscle
Capillaries	Dilatation and increased permeability	Skin and mucous membrane
Glands of external secretion	Secretogogue	Lachrymal, nasal, pulmonary and digestive glands
Cutaneous endings of pain nerves	Pain	Skin

A study of the above table will indicate why the liberation of histamine or histamine-like substance is considered to be the factor responsible for the clinical manifestations of allergic diseases. The dilatation of the nasal mucous membrane in hay fever and vasomotor rhinitis, the skin wheals of urticaria, the overdistension of the membranous labyrinths by œdema in Ménière's disease, the vasodilating feature of certain flushing headaches and the superficial cutaneous pain of myalgia of the head can all be considered to be caused by histamine release.

The clinical use of benadryl in the above mentioned diseases is then apparently justified by virtue of its marked anti-histamine properties coupled with the fact that *per se* it has rather low pharmacological activity. Atropine, for example, has certain anti-histamine effects but its cholinergic response is far more active and occurs before its anti-histamine effect is produced.

The first written report on the clinical use of benadryl was by Curtis and Owens,[6] published in April, 1945. They treated eighteen cases of acute and chronic urticaria. Prompt relief was noted in eleven cases, definite improvement in three and no benefit in four. O'Leary and Farber[7] treated fifteen cases who had acute urticaria for an average of sixteen days. Nine experienced immediate relief, five improved and one showed no benefit. The same authors treated thirty-five cases of chronic urticaria, the average duration being four years. Twenty-four of the thirty-five had angioneurotic œdema as well. Their results were gratifying. The lesions of twenty-five disappeared completely except for a few non-pruritic hives in some, seven patients were definitely improved and three were not benefited. Except for one patient there was prompt recurrence of the urticaria when placebos were administered or benadryl discontinued. It was possible in some cases to reduce the daily dose of benadryl and in one case there was no recurrence after several months discontinuance of the drug. The authors consider that in the light of their experience benadryl is highly ef-

fective in the symptomatic treatment of urticaria and angioneurotic œdema.

McElin and Horton[2] treated twenty-two cases of urticaria with an excellent response in nineteen, a good result in two and no improvement in one. In three cases of Ménière's disease classified by them as (*a*) early, (*b*) early with urticaria and (*c*) early with urticaria, hay fever and headache excellent response was obtained in all. Four cases of tension headache with vasodilating features showed marked response to benadryl. The drug was used intravenously in some of the acute hay fever cases with a dramatic response in about thirty seconds. They used 60 mgm. per 100 c.c. of physiological saline at the rate of 120 drops per minute. The oral route, however, is the commoner and more practical avenue of administration and the response, they found, though not so dramatic as the intravenous method was usually very prompt.

Koelsche and Prickman[8] in their paper report the results of treatment of fifty-two patients with hay fever. Thirty-nine patients (75%) reported benefit while thirteen (25%) reported no benefit. Of the thirty-nine patients benefited ten obtained almost complete relief, nineteen claimed 75% and ten reported 50% relief. In a group of nineteen cases of hay fever and bronchial asthma, fourteen claimed benefit while five reported no relief. In twelve cases of bronchial asthma the results were not very encouraging. Four reported benefit and eight claimed no relief. They consider that the results achieved in the symptomatic treatment of hay fever by benadryl justify its further trial. In the treatment of bronchial asthma it is obvious that a great deal of further study must be done before any definite statement can be made on the therapeutic value of benadryl. G. B. Logan[9] observed the results of benadryl in the treatment of eighteen children afflicted with asthma, hay fever, vasomotor rhinitis, urticaria and serum reactions and claims that if an adequate dosage is used benadryl can be considered to be a useful drug in these conditions. It has been found very effective in drug eruptions, notably urticarial reaction to plasma, penicillin and various antitoxins.

DOSAGE

Benadryl is prepared in capsule and elixir form. The capsules are 50 mgm. and the elixir contains 10 mgm. of benadryl per 4 c.c. There is no set dose but it is generally considered that for adults the starting dose should be one capsule (50 mgm.) three times a day. This can be either increased or decreased as determined by clinical response. As before mentioned it can also be given intravenously. The low toxicity of the drug allows a certain amount of licence in its administration.

UNTOWARD EFFECTS

By far the commonest side effect is a slight drowsiness which very seldom interferes with the patient's daily routine. Other reactions of less frequency which have been reported are dizziness, dry mouth and a feeling of nervousness.

CASE HISTORIES

CASE 1

Mr. A.M., aged 25, farmer.

Tension headache with vasodilation features. History of headache and flushing of face occurring nearly every day precipitated or aggravated by emotional tension. Duration of symptoms 10 years. Physical examination revealed nothing of note except marked dermographism. He was put on benadryl 50 mgm. three times a day. For past month he has had no headache or flushing except for two days when he was unable to procure the drug. After two weeks it was found that two capsules a day were sufficient to control the headache and flushing.

CASE 2

Mrs. H.D., aged 36, housewife.

Vasomotor rhinitis, duration 12 years, most marked in morning when she always had violent sneezing attacks. For past month one capsule of benadryl at bedtime has afforded complete relief.

CASE 3

Mrs. E.B., aged 57, housewife.

This woman gave a history of allergy to grain dust for about ten years. She was quite sensitive to flour and would always have sneezing episodes while baking bread. Skin test was very positive to wheat dust. One capsule of benadryl one hour before baking controls symptoms.

CASE 4

Miss H.P., aged 25, teacher.

Chronic urticaria and food idiosyncrasy. History of hives since childhood almost every day in greater or lesser degree. For the past four years eating of strawberries always caused stomach cramps and nausea. She was put on benadryl 50 mgm. three times a day and told to eat two large servings of strawberries every day for a week. At the end of one week she reported that she had no recurrence of hives and was able to eat strawberries without any ill effects. She was observed for a period of one month and during that time had no recurrence of symptoms.

CASE 5

Mrs. W.G., aged 43, housewife.

Very sensitive to potted plants all the year round, especially geraniums and nasturtiums. She would immediately experience nasal itching and sneezing when in the environment of these plants. On benadryl 50 mgm. twice a day she was able to insert geranium leaves in her nostrils without ill effect.

CASE 6

Mr. E.S., aged 30, farmer.

Acute giant hives, no previous occurrence. Benadryl 50 mgm. three times a day over a period of four days had no effect either on itching or duration of lesions.

CASE 7

Miss M.C., aged 20.

Hay fever for past three years. Patient was in throes of a severe attack while in office. Benadryl 50 mgm. gave relief in about half an hour. For past two weeks she had been on 50 mgm. three times a day with complete relief of symptoms.

CASE 8

Mr. H.B., aged 40, farmer.

Vasomotor rhinitis of two years' duration. The history, symptoms and signs of this case suggested that it should be very amenable to benadryl therapy but the results were disappointing. On benadryl 50 mgm. three times a day he claimed no relief.

CASE 9

Mr. A.G., aged 58, farmer.

Chronic rhinitis, duration 10 years. This man gave a history of a persistent chronic cold in the head aggravated by a dusty environment. For the past month he has been free from symptoms on benadryl 50 mgm. twice a day.

CASE 10

Miss A.B., aged 6.

Giant hives, serpiginous and circinate; acute in onset. Benadryl 50 mgm. effected relief of itching in about 30 minutes. Although pruritus was completely controlled it did not seem to have any effect on the duration of the hives.

CASE 11

Mrs. O.G., aged 45, housewife.

Vasomotor rhinitis and giant urticaria. This patient presented the most marked symptoms of the chronic cases described. For fifteen years she suffered from continual "sniffles" and presented a classical case of giant urticaria which occurred on the average of three times a week most often precipitated by emotional upset. She was put on benadryl 50 mgm. three times a day with immediate relief of symptoms. After two weeks the therapy was cut down to 50 mgm. twice a day and this has held her nicely. She has been under observation for four months and has had no recurrence of either condition. The result is rather remarkable considering the severity and duration of her symptoms.

The above cases are detailed in an attempt to illustrate the fact that they represent symptom-complexes which are generally considered to be allergic in nature and which are assumed by many to be caused by histamine release. The diagnoses for the most part are purely clinical but present little doubt. The results achieved by benadryl therapy would seem to indicate that this new anti-histamine drug rates a fair trial in the symptomatic treatment of allergic diseases.

SUMMARY

1. A short review of the available literature on benadryl is presented.

2. Physiological and pharmacological studies have shown it to have marked anti-histamine properties and low toxicity.

3. Clinically it has been found to be a useful drug in the symptomatic treatment of diseases assumed to be caused by histamine release.

4. Case histories illustrating its effect in the treatment of some common allergic diseases are presented.

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RÉSUMÉ

Présentation d'un résumé des travaux accomplis avec le bénadryl. Les études poursuivies sur ce produit démontrent que des points de vue physiologique et pharmacologique il possède une action anti-histaminique très nette et qu'il est peu toxique. Le bénadryl est un produit qui rend des services incontestables dans le traitement des états dont l'étiologie présumée est attribuable à une hyperproduction d'histamine. Des histoires de cas résumées témoignent de quelques maladies allergiques fréquentes qui en ont bénéficié.

JEAN SAUCIER

VEIN LIGATION IN THE PREVENTION OF PULMONARY EMBOLUS*

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IF one may be permitted to apply to Canada the conclusions of Collins, which are based on 10,940 consecutive autopsies, one may say that about 200,000 Canadians now living will die of a pulmonary embolus. About 2.07 to 2.72% of all deaths are due to this condition and occur in patients suffering from medical conditions as well as those who have sustained an injury; or have given birth to a child or undergone a surgical operation.[1] In fact the condition is found as frequently in those who have been confined to bed for medical reasons as in post-operative cases. About 25% of patients have a single fatal embolus; 50% have a single non-fatal embolus and 25% have multiple emboli;

* Read at the Seventy-seventh Annual Meeting of the Canadian Medical Association, Section of Surgery, Banff, Alberta, June 14, 1946.

60% of this last group ultimately succumb to a fatal pulmonary infarction.[2] Three-quarters of the cases having a fatal pulmonary embolus are over fifty years of age.[3] Gibbons states that one of every thousand cases admitted to a surgical ward will die of a pulmonary embolus, and two of every thousand postoperative cases will die from this complication, and, finally, that 8% of all postoperative deaths are due to this condition.[4]

These mortality figures are impressive but, in the tragic drama of the fatal embolism, one is inclined to overlook the prolonged and costly invalidism which is associated with the more numerous sublethal pulmonary infarctions and the permanent partial disability resulting from the extensive deep vein obstruction in the lower extremity.

The origin of these devastating emboli is a matter of great practical importance. Some undoubtedly escape from the heart. The following case is one in which the fibrillating auricles were believed to harbour thrombi, some of which became detached.

F.J., female, aged 48. On February 16, 1946 this patient was admitted to the Vancouver General Hospital for the treatment of a pharyngeal diverticulum. She had had chronic myocarditis and auricular fibrillation for years. On February 18, a gastrostomy was done for the purpose of feeding the patient. She had gained weight rapidly till March 3, when she experienced a sudden severe pain in the right chest. This was followed closely by the expectoration of bloody sputum and the appearance of a well marked pleural rub in the right axilla. The radiogram failed to show an infarction due, probably, to the increased basal shadows resulting from long standing chronic passive congestion. The onset of chest symptoms was accompanied by headache, giddiness and slight mental confusion. She had a slight fever for 24 hours and after three days she was symptom free.

Possibly a few clots escape from the region of the wound. The story of the following patient suggests that his embolus arose from this area.

G.M., male, aged 26. This patient was admitted to the Vancouver General Hospital on February 15, 1946 with a diagnosis of acute appendicitis and was operated upon the same day. On February 21, he developed pain in the right lower chest, associated with blood stained sputum. X-ray revealed what appeared to be an infarction in the right lower lobe. His temperature rose to 100 degrees on the day of onset and gradually subsided during the following four days. At no time during the next several weeks could any evidence of thrombosis be found in the veins of the lower extremities or in the pelvis. No cardiac disturbance was present so it was assumed that the embolus arose at the site of operation.

But the main source of pulmonary embolus is undoubtedly from the veins of the lower limbs; 95% of emboli, other than those of cardiac origin, arise here.[5] Frykholm has shown that incipient intravascular clotting occurs most frequently in the calf muscles and especially in the veins of the soleus muscle. The adductor muscles of the thigh are the second greatest offenders in this respect. They are involved two or three times less frequently than those muscles in the legs. In a small percentage of cases incipient thrombosis can be found in the plantar and malleolar veins and in the pelvic veins.[6] From these beginnings the thrombi tend to propagate themselves proximally into the larger channels and involve the posterior tibial, the popliteal, the femoral and iliac veins. One can anticipate that 15% of patients with phlebitis will have pulmonary emboli[7] and, of those patients who have recognizable phlebitis, 4% will have a fatal embolus.[8]

Why blood should clot in the veins in these cases is by no means clear. Possibly there is some change in the chemistry or cellular elements of the blood itself which has not, as yet, been explained. Since the brilliant studies of Aschoff there has been a strong feeling that a sluggish blood flow tends to promote intravascular clotting. Devotees of this theory encourage early active muscular exercises, deep breathing and even posture to prevent the blood from stagnating in the leg veins. Frykholm believes that the Trendelenberg position and the pressure of pillows on the calves and adductor regions produce empty collapsed veins. The opposite walls of the vessel thus being in contact the delicate endothelial lining is damaged and clotting ensues. On the basis of this theory he raises the head of the bed in order that the veins of the lower extremities may be continuously distended with blood as they are in the normal erect position.[6]

But whatever theories are held the fact still remains that intravascular clotting does occur. Many of these cases, whether recognized or not, remain local and heal. When this most desirable sequel fails to take place one of two courses may result. The initial coagulation thrombus in a small vein may propagate itself rapidly through the deep venous channels to the groin, giving rise to obstruction with acute symptoms of severe pain and swelling simulating femoro-iliac thrombophlebitis, the familiar phlegmasia alba dolens. Bauer believes that 90% of cases of femoro-iliac thrombophlebitis begin in this way, even though the initial lesion

in the calf may not be recognized.[9] If this occurs emboli need not be feared, since the clot is adherent. If the patient does suffer a pulmonary infarction one should suspect the opposite limb. In these cases there is a perivascular inflammation involving the lymphatics, the artery and the vein. The pain, swelling and nutritional changes are due to arteriolar spasm and the treatment is lumbar sympathetic block. Because of the extensive deep vein thrombosis chronic swelling of the extremity can be expected. The following case illustrates this type of lesion and the dramatic effects of this form of therapy.

M.G., male, aged 40. This soldier gave a typical history of phlebitis in the left leg while a prisoner of war in Japan in 1943. He had made a complete recovery from his attack. On October 1, 1945, while en route to Canada he developed a right-sided pleurisy with effusion and a corresponding pneumonic process in the right middle and lower lobes. His chest lesion gradually cleared but on November 12, 1945, his left leg began to swell. When examined on November 13, 1945, it was definitely swollen and he was tender over the femoral sheath. During the next four days the extremity became enormously swollen and the urinary output sharply curtailed. Beginning on November 20, 1945, the left lumbar sympathetic chain was blocked on two successive days. The extremity immediately began to decrease in size and the urinary output became greater than the fluid intake. In a week the swelling had disappeared and the patient was evacuated to his home in Eastern Canada on December 18, 1945.

The most dangerous course, however, is the less obvious pathological condition which has been called by Oschner phlebothrombosis and by Homans bland or quiet thrombosis. This is subtle and insidious in its onset and development. There may be no warning symptom or sign of its presence until the individual has suffered a pulmonary embolism. Often the patient may complain of a slight pain in the calf or there may be a slight unexplained rise in temperature. But, for the most part, its recognition before the clot breaks away depends on routine observation of the legs in anticipation of such a complication. Many patients present pulmonary and cardiac symptoms which are variously diagnosed until, much later, the true nature of the condition is made clear by the appearance of chronic permanent swelling of the lower limb. Clinically the calf is tender and Homan's sign is positive. There may be some œdema about the ankle, the superficial veins may be slightly distended and cyanosis of the foot may be observed when the patient stands. As compared with femoro-iliac thrombophlebitis the pain and swelling are trivial.

The actual lesion consists of a coagulation thrombus adherent at its origin to a small vein in a calf muscle and slowly propagating proximally through the deep veins of the leg and thigh. This subsequent addition to the original clot floats freely in the blood stream of the deep veins and fails to obstruct them in the early stages. Later there is usually some adhesion to the vein walls and obstruction to the passage of blood in their lumina eventually becomes complete. The longer the thrombus and the more freely it floats in the vein the more likely it is to escape from its mooring, pass through the heart and plug a pulmonary artery. A loose thrombus in the femoral vein is particularly ominous because of the length of clot it may contain.

The following case illustrates the subtle nature of the process and the permanently disabling nature of the obstructive lesion in the deep veins of the lower extremity.

J.J.L., male, aged 35. In March 1942, while suffering from an upper respiratory infection, this officer sprained his right ankle. After three or four days in bed he noticed that his feet were swollen, his legs blotchy and that he had some pain in his calves. A month passed with little change in his condition when suddenly he experienced a severe pain in his chest which was closely followed by the expectoration of bloody sputum. A diagnosis of bronchopneumonia was made. Within a fortnight his entire left lower limb became markedly œdematous and painful. When this was subsiding the process was repeated in the opposite leg and thigh. He remained in hospital about three months and had no other pulmonary episodes. Since then both legs have been painful and chronically swollen. On one occasion they were the site of ulceration. There are no ulcers now but the swelling and pain remain.

This patient clearly illustrates the type of case so frequently seen in which the nature of the chest lesion is not understood and in which the subject is left with a permanent disability from deep vein obstruction. We believe that interruption of the superficial femoral vein at an early stage would have protected this man from the pulmonary embolus, which he undoubtedly had, and would also have arrested the obstructive process in the deep veins before it had destroyed the important collaterals in the femoro-iliac region.

VENOUS LIGATION

In our small group of cases ligation was done in order, firstly, to anticipate the occurrence of pulmonary embolus; and, secondly, to arrest

and localize the extending clotting process in the deep veins of the limb.

Only two sites for ligation were used. In those cases in which the process had not reached the groin the superficial femoral vein was doubly ligated and divided at its proximal end. When the thrombus had reached the region of the inguinal ligament it was assumed that the process had involved or possibly arisen in the profunda femoris and ligation of the common femoral below the entrance of the great saphenous vein was carried out. It has been shown that a better collateral circulation can be expected when the common iliac vein is ligated than when the common femoral vein is tied but our patients, who were candidates for this procedure, were too ill to undergo a major operation and to take a general anæsthetic. Further, it was felt that although emboli would be trapped, the thrombus could reasonably extend up to the site of ligation and cause marked venous obstruction. Ligation of the common femoral vein with aspiration of the thrombus above and below this region will arrest the process and even if emboli do occur above the site of division they will be too small to be lethal.

The reports on the following cases indicate what may be expected from deep vein ligation.

R.C.L., male, aged 26. On April 30, 1945, the right knee joint was opened for what was thought to be a torn medial meniscus. No tear was found and a normal cartilage was removed. About three weeks later the patient complained of slight tenderness in the right calf and Homans' sign was present. No immediate action was taken and a few days later on May 26, the patient suffered a right pulmonary embolus. On May 28, the right femoral sheath was exposed under local anæsthetic. The common, deep and superficial femoral veins were found to be free of blood clot. The superficial femoral vein was, therefore, doubly ligated and divided and the wound closed.

Following this procedure the signs of phlebitis rapidly subsided and he had no further pulmonary infarctions. One will never know whether the phlebitis would have continued to progress or if further emboli would have occurred had the operation not been done. The patient was protected however. He is now active as a painter and there is complete absence of swelling in his leg.

The next case was that of a man who was suffering from a ruptured intervertebral disc.

W.M., male, aged 32. For the above condition Buck's extension with 15 pounds weight was applied to the right lower limb on October 14, 1945. This was constantly maintained till November 4, 1945. During this period he was encouraged to move the leg as much as possible and his exercises were supervised daily by a physiotherapist. On being released from traction he was allowed up. It was then noticed that he had a peculiar limp and on further investigation it was found that the patient could not dorsiflex his ankle due to pain in the calf. The posterior compartment of the leg was swollen and tender and the muscles were in spasm. A venogram was done and found to be negative. Slight œdema was observed posterior to the malleoli.

Since neither the patient nor the staff were aware of this condition until the traction had been removed and walking attempted, it was difficult to judge how long the process had been present. In any case it was decided that the safest course was to divide the superficial femoral vein. This was done under local anæsthetic on November 7, 1945, after the three femoral veins had been examined and found to contain no thrombus. The day after the operation the phlebitis extended up the superficial femoral vein to the site of ligation. This vein could be palpated as a very tender, hard cord in Hunter's canal. Following this the acute symptoms and signs rapidly disappeared and the swelling also subsided.

It is unlikely that this patient would have had a pulmonary embolism if operation had not been done because the process was fairly acute. There is every reason to believe, however, that if the superficial femoral vein had not been interrupted, the progressive thrombosis would have reached the iliac veins and their branches leaving him with a permanently swollen leg. It is also noteworthy that bland phlebitis occurred at all in this case. His limb was constantly higher than his body permitting excellent drainage of the venous system and this drainage by gravity was assisted by active muscular exercises. It is apparent that in this case, at least, the incipient thrombosis was not due to stasis.

The following case is one in which the results are difficult to estimate.

K.H., male, aged 29. This man was admitted to Vancouver Military Hospital on April 24, 1945, complaining of a deep ache in his right knee joint and a history of periodic locking. A diagnosis of a torn medial meniscus was made. Before operation was done the patient had a bout of pain in the right abdomen suggesting ureteral colic. A thorough investigation of the genitourinary tract and abdomen failed to show any lesion. On June 4, the right knee joint was opened, a bucket handle tear of the medial meniscus found and the cartilage removed. Five days later the patient developed tenderness in the right calf with signs characteristic of phlebothrombosis and the same day the veins at the groin were exposed and inspected. No evidence of thrombosis was found and the superficial femoral vein was ligated in continuity just below the entrance of the profunda branch.

Following the operation no extension of the phlebitis occurred but the patient complained of pain in his calf for a few weeks and finally pain in the outer side of his right knee joint. This last complaint has remained unexplained till the present with the result that he has refused to use his knee.

The operation may or may not have arrested the phlebitis but it is important to note that, in spite of muscular atrophy and a failure to use the limb, swelling

has not been an important feature. The affected leg is actually 2 cm. larger than the unaffected side. Originally it was thought that, since the vein was ligated in continuity, sympathetic nerve disturbance might have caused this distress. However, there was no evidence of vasospasm and lumbar sympathetic block failed to relieve the pain.

Other causes of non-fatal pulmonary embolus arising from phlebothrombosis, which had not extended beyond the calf and for which superficial femoral ligation had been done, might be reported but they would illustrate nothing more than has already been shown. As will be understood, this type of ligation is suitable for the case in which the lesion is relatively early and still confined to the area drained by the superficial femoral vein.

The following ligations were done for cases which were more severe and extensive and, for the most part, later in the course of the disease.

F.C., male, aged 49. On November 24, 1945, this man had a partial gastrectomy for pyloric stenosis due to a duodenal ulcer. The following day a right-sided atelectasis was diagnosed. Nine days after his operation the wound broke down and had to be resutured and the same day it was noticed that the right leg was swollen. By December 5, his right foot was cyanotic, he was tender in the calf and the right thigh was becoming œdematous. Both the great saphenous vein and the femoral vein in Hunter's canal could be palpated as hard tender cords. At operation the same day these veins were found completely occluded by clot. The common femoral vein was opened above the entrance of the saphenous and a soft whitish clot was found floating in the blood stream. When this was sucked out bleeding occurred freely from above and the vein was doubly ligated and the division completed. Four days later all evidence of swelling in the right leg had disappeared. On December 11, he suffered a small pulmonary embolus. It was assumed to have arisen in the left leg and the common femoral vein on this side was interrupted above the entrance of the saphenous. The assumption was fairly proved to be correct because the left calf became demonstrably swollen and tender during the next two days. From this point on his convalescence was uneventful. The swelling in the legs was never troublesome and by March 20, 1946, when last seen, it had entirely disappeared.

The question of ligating the common iliac vein on the right might arise but another major procedure on this patient was unthinkable. At the same time ligation of the superficial femoral vein on the left might have been sufficient. It has been shown however that there is no residual œdema after ligating either the superficial or common femoral veins.

The next case is one in which there had been bilateral ligations for multiple pulmonary emboli.

P.W., male, aged 24. On February 10, 1945, this patient had a bone graft of the right femur for a compound fracture of this bone. The graft was taken from the right tibia, and he was immobilized in a Roger Anderson apparatus. On February 25, he developed pain in the right lower chest and expectorated blood-streaked sputum. Two days later his temperature rose to 102°. No evidence of phlebitis could be found in the legs. He improved till March 2, and then developed pain in the left chest with a rise in temperature. Bilateral venograms were made and still no lesion could be demonstrated in the lower extremities. On March 5, his right foot was seen to be cyanosed, his pulse was rapid and he had a temperature of 102°. On this evidence the right external iliac vein was ligated on the same day under spinal anæsthetic. This vein was chosen to avoid the pins and apparatus in the thigh. During the next two weeks his temperature returned to normal. Again, on March 21, he developed pain in the right chest associated with bloody sputum and a rise in temperature. It was thought that this embolus had arisen in the left leg and it was decided to ligate the common femoral on this side. This was done with the aid of local anæsthesia on April 23, 1945. No further episodes occurred and his further convalescence was progressive. His œdema subsided rapidly and now he has no swelling. His superficial veins show compensatory dilatation.

Not all emboli arise from deep vein phlebitis as will be seen from the account of the next case.

C.J., male, aged 46. In 1938 this patient had injection treatment for varicosities of the right great saphenous system. He was symptom free till August 25, 1945, when he developed a phlebothrombosis of this vein extending up to the groin. He was treated by rest in bed for three weeks and then discharged from hospital. Two days after discharge he experienced a severe pain in the left lower chest and after two more days was brought to Vancouver Military Hospital with a left pulmonary infarction. The right saphenous vein was hard and tender and the overlying skin was red. The day of admission the three femoral veins were exposed under local anæsthesia and found to be free of thrombus. The great saphenous vein was thrombosed to its junction with the femoral where it was tied and divided. It contained soft friable blood clot which was becoming organized in some areas.

The clot in this instance appeared to have extended into the common femoral and iliac veins and then became detached. It is not unreasonable to suppose that this would have occurred again if ligation had not been done.

CONCLUSIONS

Our series of cases is much too small to draw definite conclusions. One can only say that in the eleven cases which we have operated upon for this condition during the past year there have been no deaths from pulmonary embolus and none of these patients have been left with chronically swollen legs. Our chief problem has been to distinguish between those cases whose lesion would remain local and resolve, and those in which the clotting process would extend with resulting widespread deep vein occlusion or pulmonary embolism or both. By and large, the more obscure the symptoms and signs the greater is the danger from embolic phenomena. We feel, too, that in the more

acute and overt lesions, in which the development of emboli is unlikely, a tendency to extend proximally should be checked at once by vein interruption in order to prevent the occurrence of chronically swollen limbs which are far too commonly seen.

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RÉSUMÉ

Environ 2.07 à 2.72% des morts sont dûes à des embolies pulmonaires, et il semble que la plupart de ces embolies proviennent des veines des membres inférieurs: 95%. Les éventualités pathogéniques des phlébites et de la formation des caillots sont discutées. La ligature veineuse évite l'embolie pulmonaire et arrête l'évolution du caillot. Les 10 malades opérés qui sont ici rapportés ont survécu et aucun n'a conservé d'œdème des jambes. Il est difficile de prévoir quels cas demeureront localisés et quels se compliqueront d'embolie. Dans les lésions aigues et ouvertes, on peut éviter l'extension proximale du processus phlébite-embolie par l'interruption veineuse précoce. On préviendra ainsi, et l'embolie et l'œdème chronique des jambes.

JEAN SAUCIER

THE MANAGEMENT OF EMERGENCIES IN DIABETES MELLITUS*

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DIABETIC ACIDOSIS AND COMA

THE major emergency in diabetes is, of course, diabetic coma, and all other emergencies are to be feared lest coma develop as a complication. Coma has been described as being of variable degree, on the basis of clinical state and on the ability or inability to arouse the patient. Since the condition is primarily related to the degree of acidosis it would perhaps be best to follow Joslin and define diabetic coma as a condition of diabetic acidosis in which the carbon dioxide combining power of the blood plasma is twenty volumes per cent or less. Lesser degrees of acidosis would then be referred to as diabetic acidosis and such terms as pre-coma would be abolished.

Before considering the treatment of coma let us consider briefly the pathological physiology of this condition. Diabetic coma is the end result of uncontrolled diabetes. The normal break-down of fatty acids by oxidation at the beta carbon atom continues to the production of butyric acid, or the four carbon atom stage. A portion of the butyric acid formed is converted to aceto-acetic acid and beta-hydroxy-butyric acid, both of which again may yield acetone. These substances known as ketone bodies being highly acid combine with the base of the plasma, thus reducing the available base as measured by the carbon dioxide combining power.

It was believed until recently that the normal oxidation of fatty acids was arrested at the butyric acid stage, and that further oxidation required the coincident oxidation of an equivalent amount of carbohydrate. This led to the idea of the ketogenic-anti-ketogenic ratio, and it was said that fats burn in the fire of carbohydrate. Mirsky[1] has shown that glucose has no influence on the oxidation of ketone bodies, but that a low liver glycogen content as found in diabetic acidosis permits an increase in fatty acid metabolism with the resultant production of ketone bodies in the liver and their discharge into the blood stream at a greater rate than can be utilized by the muscles. Insulin prevents this overproduction of ketone bodies by restoring the glycogen content of the liver. A high carbohydrate intake will produce a rise in blood sugar which is often associated with an inhibition of ketone production, but it would be unsafe to use glucose alone without insulin in treating a case of diabetic coma.[2]

The keto acids combine with base from the plasma and are excreted by the kidney, thus reducing the plasma base. Chloride is also lost from the plasma by several routes; namely, as hydrochloric acid by vomiting which is commonly associated with acidosis; as chloride in the urine, due both to marked diuresis (produced by ketone bodies) and to replacement of chloride ion by oxybutyric anion and subsequent excretion of chloride as ammonium chloride. The end effects of these developments are: (1) a hæmo-concentration; (2) a depletion of the fixed base of the plasma; (3) a depletion of plasma chloride; (4) a lowering

* Read at the Seventy-seventh Annual Meeting of the Canadian Medical Association, Section of Medicine, Banff, Alberta, June 12, 1946.

of the carbon dioxide combining power of the plasma; and (5) a shift of the plasma pH toward the acid side.

The rational treatment of diabetic coma, therefore, should be aimed at correcting these disturbances. Before leaving this discussion, one should point out that diabetic coma may occur without ketone bodies being noted in the urine. This is by no means a common finding, but there are quite a number of cases quoted in the literature, and one may come up against it occasionally.[3] It has been explained as being due to failure of renal function, or in some cases to the excretion of all the ketone bodies in the form of beta-hydroxy-butyric acid. This latter does not give a direct Gerhardt or Rothera test, but must first be oxidized with hydrogen peroxide. This emphasizes the importance of doing a carbon dioxide combining power determination in all cases of suspected acidosis or coma.

When presented with a case of diabetic coma the physician should immediately ask himself: "why did this patient develop coma?" The answer may be fundamental in the treatment. In a new case not previously diagnosed as a diabetic, the cause may be an infection overwhelming a latent diabetes, or the consumption of body tissues, largely fat and protein, in a patient suddenly abstaining from food on account of an intercurrent infection. Similar factors may be at work in a known diabetic, but here the cause is more often dietary indiscretions or the omission of insulin. Many diabetics do not realize that if they do not eat they still need insulin to cover the metabolism of body tissue. Among the infections to be looked for as a precipitating cause to diabetic coma are: otitis media, upper respiratory infections, pneumonia, carbuncle, gastro-intestinal infections, acute appendicitis, and many infectious diseases of childhood.

It is imperative that a complete physical examination be done early in the management of a case of coma, since the treatment of the precipitating infection may be the key to the whole prognosis. However, it must also be remembered that diabetic acidosis alone may produce fever, leucocytosis, severe chest or abdominal pain associated with widespread tenderness and even spasm, and therefore surgical operation should not be done in a diabetic until adequate insulin therapy has been given a chance for three or four hours. In this way unnecessary and dangerous operations may be avoided.

AN OUTLINE FOR THE TREATMENT OF DIABETIC COMA

The proper management of a case of coma demands constant supervision, frequent laboratory tests, and therapeutic procedures requiring facilities for intravenous infusion. It should therefore be mandatory that the patient be admitted to hospital. If the diagnosis is certain when seen in the home a preliminary injection of twenty to forty units of insulin should be given at once, the dose depending on the clinical condition. The hospital should then be notified of the expected patient, and the house staff make immediate preparation for his admission. Such preparation should include a warm bed, with hot water bottles, insulin and stimulants, stomach and rectal tubes, saline and glucose solutions, a sterile catheter set, and notification of the laboratory technician.

On admission to hospital the patient should be immediately put to bed—in a private room if possible. Blood sample should then be taken for sugar, chloride, urea (or non-protein nitrogen), carbon dioxide combining power, and blood grouping for possible later transfusion, and a urine sample should be taken for sugar and ketones.

As soon as the diagnosis is established, 50 to 100 units of protamine zinc insulin, and from 25 to 50 units of unmodified insulin should be given, dosage depending on laboratory findings. Some of the unmodified insulin may be put in an intravenous solution, but this will not usually be necessary, except in cases with circulatory collapse. An intravenous infusion should now be started. Physiological saline for the first part is all that is needed since the blood sugar will usually be high. The patient is in need of both fluid and sodium chloride. One thousand to fifteen hundred c.c. should be given at the rate of 15 to 20 c.c. per minute. Faster than this may produce cardiac embarrassment. If the patient has signs of hyperthyroidism, 1 c.c. of Lugol's solution should be added to the intravenous.

The patient should be given a cleansing enema and a gastric lavage unless *in extremis*. Usually the bowel and stomach are distended.

Washing these out also provides another route for the administration of fluid. The stomach should be washed out with 500 c.c. of 5% sodium bicarbonate. Some authorities advise leaving 100 c.c. of this solution in the stomach, and administering a further 500 c.c. intravenously if the carbon dioxide combining power is below twenty volumes per cent.[4] Usually this is not necessary, but in cases of profound acidosis it will speed recovery.

In children circulatory stimulants are not usually necessary, and in adults with signs of circulatory failure their effect is transient. However, they should be available for emergency use. Adrenalin may be given for extreme collapse. Ephedrine will produce a more lasting effect. Blood pressure should be recorded hourly, and in cases showing a progressive fall, or if systolic pressure drops below 80 mm. of mercury, one may use up to 60 c.c. of 10% sodium chloride given slowly. Arrangements should then be made for blood transfusion. Transfusion will sometimes turn the tide in cases not responding to usual routine. The use of hypertonic saline just mentioned will also very often produce dramatic results in cases of kidney failure with anuria not responding to physiological saline and glucose. Each urine sample should be collected separately for urinalysis, and if the patient has not voided in three hours he should be catheterized.

Subsequent treatment depends on laboratory findings at three hour intervals until the patient has regained consciousness. Unmodified insulin should be given as follows: 20 units for 4% sugar or more; 15 units for 3%; 10 units for 1%. After the patient has regained consciousness and blood determinations are approaching normal, time intervals for treatment may be lengthened to six hours. The patient should receive at least 60 c.c. of fluid per kilogram of body weight in the first 24 hours. Five per cent glucose in saline will be useful after the first three hours in preventing overtreatment with insulin.

As soon as the patient is conscious and can take fluid by mouth one may give orange juice or 10% glucose in doses of four ounces every three hours. At this point certain complications should be kept in mind. Hypoglycæmia may be avoided by frequent blood sugar determinations and by giving carbohydrate early. Frequent laboratory tests are needed to prevent return to coma after temporary recovery. This is one of the most important reasons for having the patient in hospital. Circulatory collapse and anuria should be watched for and treated immediately they appear. Ephedrine, coramine, caffeine, and transfusion of whole blood are useful, and 10% sodium chloride may be needed for anuria.

After twenty-four hours, and after the patient's dehydration and acidosis have been taken care of, return to diet should be gradual. Fruit juice, skim milk and oatmeal gruel are usually tolerated well. For the first few days it is well to give feedings at six hour intervals with the 24-hour carbohydrate divided into four equal parts. In this way the patient has a constant steady supply of carbohydrate and is not subject to long fasting period from evening meal to breakfast. After the diet has been built up to basal metabolic requirements it can then readily be redistributed in three ordinary meals, controlled with a basic a.m. injection of protamine zinc insulin supplemented with a.c. regular insulin doses. Eventually the total daily insulin can then, in most cases, be gradually transferred to an a.c. breakfast dose.

MANAGEMENT OF INFECTIONS IN GENERAL

The diabetic out of control is very vulnerable to infection, but the controlled diabetic is very little more so than the normal individual. The nutritional state of the patient is a prime factor in his resistance to infection. The uncontrolled diabetic shows poor agglutinin production in response to infection. Local infections even of a trivial nature should receive prompt surgical treatment.

If the infection is general one must be on the alert for acidosis. Infection in the diabetic usually leads to increase in the severity of the diabetes. This may require up to four times the regular dose of insulin, and is probably due to a variety of factors, such as destruction of insulin by trypsin of pus cells, increased metabolism of fever, depletion of liver glycogen by bacterial toxins, and development of insulin insensitivity. The latter factor may be related to sodium and potassium metabolism, since it has been shown by Wilbur and Wilder that insulin sensitivity may be increased by a large intake of sodium and restriction of potassium.

Acidosis can be prevented in many infections by frequent testing of the urine and the prompt

use of additional unmodified insulin. The patient should be taught to take enough insulin to keep his fasting urine sugar-free, even though he reduces his food intake on account of anorexia. Carbohydrate in the form of fruit juice and oatmeal gruel is usually well tolerated. In modern times the advent of the sulfonamides, and more recently of penicillin, has been extremely valuable to the diabetic in preventing coma from infections. With control of infection one must be careful to reduce insulin dosage again according to need and avoid hypoglycæmia.

CARBUNCLE

All diabetics should be warned of pyogenic skin infections, and should be impressed with the necessity for cleanliness. They should be instructed not to pick or squeeze any skin lesion, no matter how trivial it may appear to be. Penicillin has revolutionized the treatment of carbuncle. Rest in bed with rigid diabetic control, and the use of gauze dressing with boric acid and 50% alcohol to prevent local spread, may be sufficient when combined with intramuscular penicillin. Many early lesions will resolve without proceeding to localized pus formation under this routine. When pus accumulates it should be released, but wide crucial incisions are to be avoided.

CARDIOVASCULAR DISEASE

The diabetic is particularly prone to the development of arteriosclerosis. However, there does not seem to be any direct correlation between the severity of the diabetes and the degree of arteriosclerosis. In the treatment of coronary disease one should realize that the diabetic heart stores glycogen only if the blood sugar is maintained above normal. It is therefore important that such a patient should not be subject to periods of hypoglycæmia, and it is perhaps safer to allow him to carry a blood sugar a little higher than one otherwise would. If he is controlling himself according to urine tests he had better regulate his insulin to show a faint trace of sugar in the fasting specimen. In some cases of coronary thrombosis there is a definite decrease in sensitivity to insulin, and the dosage will have to be increased accordingly.

In the treatment of peripheral vascular disease with impending gangrene in the diabetic, one can do a great deal with bed rest, alcohol swabs, and a dry heat cradle. If the patient will persist in this treatment and maintain rigid control of diabetes many an amputation can be avoided, or at least postponed for some considerable time. Cellulitis and perforating ulcers may be adequately handled by medical treatment, bed rest, elevation, and penicillin intramuscularly.

When gangrene appears it should be given a short trial on medical treatment. Dry dressings are advocated for dry gangrene and alcohol gauze for infected gangrene. If, after twenty-four hours, the gangrene is subsiding, medical treatment may be continued; if, however, it is spreading rapidly, or has reached the ankle, amputation is recommended. When amputation is done it should be done high in the first instance, or it will have to be repeated. Toes should never be amputated.

PULMONARY TUBERCULOSIS

Pulmonary tuberculosis is much more common in the diabetic than in the non-diabetic, and this is even more marked in those who have a history of coma. All diabetics should have a chest x-ray as part of their routine examination on diagnosis, and an annual re-check is advised. In uncontrolled diabetes, tuberculosis tends to spread rapidly. With a rapidly developing pulmonary lesion increase in sensitivity to insulin may be very marked. This is especially true if there has been a rapid loss of weight. One is then beset with frequent hypoglycæmic reactions even on low insulin dosage.

The coincidence of these two diseases provides a problem in dietetics, since in the one case over feeding is the rule, whereas in the other it is to be avoided. The total caloric intake should be adjusted to restore the normal average weight. A diet low in protein and relatively high in fat and carbohydrate is probably the best for the patient with pulmonary tuberculosis. High protein by its specific dynamic action speeds metabolism. The highest death rates in tuberculosis are those with low lipoid content.[4] Our experience with diets very high in carbohydrate and very low in fat has not been particularly satisfactory. Wide fluctuations in blood sugar levels have occurred. We have found that a more moderate mixture of fat and carbohydrate leads to smoother control with insulin. Control and arrest of pulmonary tuberculosis is quite possible in a co-operative patient, and indeed

these patients are as a rule among the most co-operative.

HYPERTHYROIDISM

The possibility of hyperthyroidism in a case of diabetic coma should always be considered. If signs are present, iodine is advised as part of the coma treatment regimen. Conversely, one should be wary of making a false diagnosis of diabetes in a hyperthyroid with glycosuria, an elevated fasting blood sugar, and an abnormal glucose tolerance curve. Hyperthyroidism interferes with the storage of liver glycogen—antagonistically to insulin action. The increased metabolism it produces also calls for increased insulin requirement. With a liver low in glycogen and an increased insulin requirement severe insulin reactions are frequently encountered. Hyperthyroidism in a diabetic should be treated early by thyroidectomy, since its persistence will lead to an increase in severity of the diabetes.

PREGNANCY IN THE DIABETIC

It is unwise to disregard the finding of glycosuria during pregnancy. Even though transient it may be evidence of a latent diabetes. A glucose tolerance test done three months post partum will settle the issue. Pregnant diabetic women are subject to fluctuation in carbohydrate tolerance, and great care must be taken in their control.

Total metabolism is increased, glycogen stores are lowered, and acidosis is always to be feared. The incidence of eclampsia in pregnant diabetics is 5% as compared with a rate of 0.3% in the non-diabetic.[5] Although the mortality rate of the mother has steadily decreased since the advent of insulin, and the use of higher carbohydrate diets, the fetal mortality has remained high until very recently. This recent improvement has been due chiefly to control of hormone balance by substitution therapy. Monthly determinations of prolan and œstrin in the urine will indicate the danger of toxæmia. Toxæmia is likely in a case with rising prolan, and with a high prolan and a low œstrin in the later months toxæmia is almost certain. Hormone imbalance has been found in 60 to 70% of diabetic pregnancies.[6]

The ideal routine is to do prolan levels in all cases, but this is not always practical owing to lack of laboratory facilities. In the absence of such control routine hormone therapy in all cases is advocated by White.[6] The high cost of progesterone often makes this impossible. However, these procedures will reduce fetal mortality in the diabetic to normal levels.

The pregnant diabetic should receive a high intake of thiamine on account of her increased metabolism. She should be followed by daily urine tests for sugar and ketone, and it is better to allow a trace of sugar since hypoglycæmia is bad for the fetus. In the later months hypoglycæmia from fetal insulin must be considered. Another point which one should watch for is the development of a lowered renal threshold for sugar. The mother may be excreting sugar with a low blood sugar. Periodic fasting blood sugar determinations are therefore advocated.

The most difficult patients to control are those whose diabetes is of long standing or had its onset in childhood. This group provides the greatest risk, both fetal and maternal. With the possible exception of the very mild diabetic of recent onset, the leading authorities at present favour Cæsarean section at the thirty-sixth to thirty-seventh week as the best method of delivery. As a rule the diabetic mother should not be allowed more than two children, the second Cæsarean being accompanied by sterilization.

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Is it necessary and desirable, that the State should become the physical owner of every hospital? A hospital is something more than a place in which expert work is done. It is a living entity, a centre of local loyalty and affection. The essence of a good hospital service is that there should be local interest in it and responsibility for it. Will that continue if the State becomes the physical owner of the hospital? That is an issue for us to ponder. Will the conversion of every institution into a State establishment improve the quality of the hospital service? Is there sufficient evidence of the wisdom, humanity, and capacity of the State to justify the abolition of the local character and ownership of hospitals? Is this gamble one which in the public interest we are justified in taking? The endowments of voluntary hospitals other than teaching hospitals will pass, via the Minister, to the region. Local hospitals, other than the teaching hospitals, will not be permitted to accept or hold endowments. It will be no longer more blessed to give than to receive.—Dr. Chas. Hill, *Brit. M. J.*, May 11, 1946.

THE SURGEON-ANÆSTHETIST RELATIONSHIP*

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THIS being the first meeting sponsored by the Manitoba Division of the Canadian Anæsthetists' Society, may I be permitted to digress from my subject to pay tribute to two members of our profession who limited themselves to this field and who were held in the highest esteem by their professional contemporaries. I would also like to refer to some of the more recent activities which led to the formation of the local Anæsthetists' organization.

Dr. William Webster was the pioneer anæsthetist of Western Canada and was the first to specialize and limit his work to this field. He conformed to the modern conception of an anæsthetist, seeking the effects of his drugs in the physiological laboratory of the late Professor Swale Vincent. According to one of his biographers, Dr. Aikenhead, "his opinion was in harmony with the modern viewpoint that doctors would be chosen as anæsthetists by virtue of their efficiency in the correlation of the scientific and practical aspects of anæsthesia". Dr. Webster was appointed lecturer in 1905 by the Manitoba Medical College and Honorary Anæsthetist to the Winnipeg General Hospital in that year. From 1907 on, he confined his work to this specialty. In that year, he gave a spinal anæsthetic, probably the first in Western Canada, to a patient with acute intestinal obstruction. In 1914, Dr. Webster joined the armed services and became lieutenant-colonel of the 4th Canadian Field Ambulance. By all his brother officers and his men, he was considered a fearless soldier. His tragic death came suddenly in 1934 at the age of 69.

Likewise, I would pay tribute to the memory of the late Dr. Edith Ross, specialist in anæsthesia, who carried on for Dr. Webster as anæsthetist at the Winnipeg General Hospital in his absence during the first World War. She possessed a charming personality. She was efficient, careful and wise in the performance of her work, a favourite with patients and surgeons alike. After leaving the Winnipeg General Hospital, she became anæsthetist to the St. Boniface Hospital where she continued until her health failed.

According to the Divisional Secretary, Dr. Donalda Huggins, the first study group among anæsthetists in Winnipeg was formed during the winter of 1941-1942. Regular monthly meetings were held at which original articles were presented and papers were read and discussed and newer anæsthetic agents and methods of induction studied. In October, 1945, the Winnipeg Anæsthetists' Society met to organize the Manitoba Division of the Canadian Society and a request that the Winnipeg group constitute a section of the Winnipeg Medical Society was granted in January, 1946. There are now sixteen members of this Society in the Manitoba Division. The Winnipeg Medical Society has good reason to be proud of the new section. With the enthusiasm that has marked its beginning, and with the sustained interest of the members, I know that this specialty will develop and attain the status which it deserves.

In the past, the surgeon had adopted the attitude that he alone assumed full responsibility for the patient and that every phase of the operative procedure, including the administration of the anæsthetic, must be under his direction. Despite the fact that this state of affairs constituted a heavy burden to himself, in addition to the actual performance of the operation, one cannot deny that many surgeons revelled in this rôle of exalted authority and would have relinquished it only with considerable reluctance. Under this arrangement, the anæsthetist was little more than a technician whose few duties included keeping the patient asleep and relaxed with a profound anæsthetic agent such as ether or chloroform. However, if the patient failed to survive the operation, the anæsthetist was expected to assume complete responsibility for the unexpected fatality!

After serious contemplation with an open and sympathetic mind, I can understand that this state of affairs was intolerable and could not continue indefinitely. Now one can appreciate that this organizing of anæsthetists is the result of the release of pent-up emotions, and one realizes that despite their customary calm, pleasant and reasonable exterior, they have

* Department of Surgery, Winnipeg General Hospital. Delivered at a joint meeting of the Winnipeg Medical Society and the Canadian Anæsthetists' Society (Manitoba, Saskatchewan and Alberta Divisions), March 15, 1946.

harboured deep and abiding resentment which has finally erupted after simmering for many years. The Canadian Anæsthetists' Society, incorporated in 1943, symbolizes a portion of this renaissance of anæsthesiology. However, no one will welcome the formation of this Society and the carrying out of its objectives more than the surgeons.

Already, mention has been made of the extraordinary manner in which the surgeon once shouldered the complete responsibility involved in every case. But now a change in the character of the anæsthetist's functions has occurred and, with this new development, the anæsthetist assumes heightened responsibilities, which elevate him in medical society. He is no longer a technician but a specialist and a consultant and obviously he must be a medical graduate.

This change in status has resulted in an encroachment by the anæsthetist on the field of influence of the surgeon but this new deal has not burst suddenly upon us. However, I became definitely aware of the change by a recent experience at the hands of one of your colleagues, none other than your President, Dr. Aikenhead. Towards the end of a hard morning's work, when already weary because of some time-consuming cases and having helped tidy up the room from the previous operation, I found myself trying to restrain the patient during a difficult induction. Dr. Aikenhead entered the theatre and, without any ceremony, suggested I prepare myself for the operation and leave the handling of the patient to himself and the others in the room. A few minutes later, when all was under control, he reproached me by saying that I reminded him of a certain Bishop who took his responsibilities most seriously. Every night he was accustomed to pray at great length for the spiritual and physical welfare of each and every member of his flock. The loss of sleep was such that his health was impaired but nothing could dissuade him from what he considered was his duty. Finally, in the small hours of the night, he heard a voice beside him saying, "Bishop, I am God; go to sleep. Leave your worries to me". "So", Dr. Aikenhead repeated, "you remind me of the Bishop". To which I replied, "I may be the Bishop, but who —— do you think you are?"

Medicine continues to be a science that is forever growing and progressing and its advances are notable. Gains in one field beget or influence successes in another. Thus the brilliant researches of Pasteur demonstrated the germ theory of putrefaction to Lister and his achievements in asepsis revolutionized surgery. As a result, disease has been attacked with safety to the patient in one body cavity after another as improvements in technique have been attained. So far as surgery is concerned, its problem today as it has been in the past and as it will continue to be, is the relief of the patient as quickly and efficiently as possible. This subject involves the consideration of many phases of medicine, *viz.*, diagnosis, preparation for surgery, the operation itself, and finally, the no less important after care. The evolution of modern medicine, as it is practised in hospitals and medical centres of any size, has produced a division of labour or effort among the profession. No longer is it reasonable that an individual should be responsible for all phases of medical care. It is now generally agreed that the trend of specialization has resulted for the most part in benefits to the patient through increased efficiency in his medical attendants.

However, if there is truth in this it is because the specialist, to work efficiently, must have some relationship with others who, altogether, represent the whole of which the specialty is a part only. In the field of medicine, there is no better example of such co-operation than in surgery and anæsthesia. The fine advances in the relief of disability and suffering, which have resulted during the years since Lister, cannot be imagined if those unavoidably cruel days of surgery before anæsthesia had not been eliminated by the first administration of ether by Long in 1842 and its popularization by Morton in 1846. So completely has this achievement been accepted that today little thought is given to the advantages resulting from anæsthesia. They have become familiar and are expected. The anæsthetist has assumed a most important rôle in the drama played daily in a thousand operating-rooms, yet the importance of his part is not recognized fully except by his professional associates. Little imagination is necessary to appreciate the benefits of unconsciousness at the time of surgery. It is not only a boon to the patient, but the relaxation is an inestimable technical aid, in the exposure of the operative field, that only the surgeon can evaluate.

It is remarkable, inasmuch as many patients fear the anæsthetic more than the operation, that so little emphasis is placed on the capabilities of the anæsthetist in preliminary discussion with the patient regarding his coming ordeal. Frequently, the type of anæsthetic is mentioned and occasionally the patient may express some choice in this matter but only rarely is he concerned about the qualifications of the individual who will administer it. Too often we fail to impress the patient *that the anæsthetist is much more important than the agent.* It must be confessed also that we fail too often to give our colleagues, the anæsthetists, the full measure of credit to which they are entitled.

In a comparatively brief time a variety of anæsthetic agents, apart from ether, have made their appearance and many refinements in their use have resulted. It is no longer possible to practice anæsthesia without familiarity and experience in the administration of these new methods. This has led, of necessity, to specialization in anæsthesiology, since the principle in anæsthesia is now to make the anæsthetic fit the patient and his problem instead of the reverse. As a result of this progress, the field has become an intensely interesting and promising one; naturally providing many attractions which more and more of the members of the medical profession are accepting. The fully trained and capable anæsthetist is an increasingly welcome member of the surgical team. He no longer resembles the anæsthetist of an earlier day whose work was limited to the production of a state of unconsciousness in the patient and whose manner of doing this was of necessity limited by the means available at that time.

The modern conception of surgery is that it is performed by a group or a team. Each member of such a team has his own tasks to perform in order that the procedure in hand may reach a successful conclusion. The ability to perform such tasks depends upon training, experience and personal ability. Some of the team work demands less of these qualifications than other parts. Thus, excellent operating-room nurses may be developed in a year's continuous work. On the other hand, a highly qualified surgeon must have first been prepared to spend many years as an assistant to his surgical preceptor before his technical skill has reached a high level, while that indeterminate quality known as judgment is obtained still more slowly. In more recent years, the emergence of the anæsthetist to assume his rightful position has provided the surgical team with a strong and most welcome addition. His training is specialized but it is a training based on broad principles concerned not only with methods of anæsthesia but with other subjects. His knowledge of his drugs depends upon post-graduate training during which time he has the opportunity of studying their effects in animal experimentation as well as in clinical administration. His knowledge, of necessity, must include a most thorough grasp of physiology of the cardiac and respiratory systems and the anatomy of certain body areas where regional anæsthesia is commonly employed During the operation, he is more often the "silent partner" employed in a number of tasks with efficiency and without turmoil, thus freeing the surgeon from anxieties, responsibility for which may impair his work and judgment.

Let us enumerate those measures which are now applied to determine the status of the seriously ill patient who requires surgery. Complete investigation results not only in more accurate diagnosis but permits evaluation of the patient's cardiac, renal and hepatic reserve. This may be assessed by the combination of clinical observations and laboratory tests with greater accuracy than formerly. In the same manner, degrees of anæmia, hypoproteinæmia, avitaminosis, dehydration, and mineral deficiency, which may follow prolonged vomiting or starvation as the result of disease, may be recognized and corrected prior to operation. Metabolic and endocrine imbalance associated with hyperthyroidism and diabetes are better understood and more effectively controlled than prior to twenty-five years ago. We depend upon the medical consultant to recognize and correct these and other matters. This involves careful preoperative preparation which may be considered as the second stage in the planned management of the surgical case. It means that a patient requiring a major surgical procedure is no longer operated upon the day after his admission. Sufficient time is permitted to allow for a substantial improvement in his general condition as far as this is possible before the actual attack upon the diseased organ is undertaken.

Towards the end of this period, the anæsthetist enters the picture. Armed with the information now available, he can determine the type and amount of preoperative sedation. He is able, now, to advise what most suitable anæsthetic may be employed. It is at this very point that a salutary change has occurred in the relationship of the anæsthetist to the patient. He meets and talks to the patient on the ward, reviews the history and the results of special tests, and shares some responsibility for the preoperative medication. The result, as far as the patient is concerned, of this careful preparation and consultation with internist and anæsthetist, is his arrival in the operating-room better fitted psychologically and physically for the ordeal he faces. Once in the operating-room, the team-work already started on the ward continues, only the ward nurse is now replaced by the scrub nurse. From this point onwards, the closest collaboration must prevail between the surgeon and anæsthetist. *Ample time must be allowed for proper and unhurried induction. Here, time may often be saved by waiting.* In abdominal surgery, certainly, muscular relaxation together with an adequate incision are the two factors which contribute so much to the reduction of the hazards of surgery and make for precision in anatomical dissection.

In a critically ill patient, it is often well to divide the operation into stages, a matter which may have to be decided by consultation between the anæsthetist and surgeon. Here the rule that *it is wiser to do less twice than too much once* should be observed. It is, of course, during the operation that the anæsthetist is making his greatest contribution. Proper oxygenation as well as relaxation is of paramount importance. The damage produced by a state of hypoxia cannot be overstressed, as it effects not only the brain but other cells in the body. Intratracheal intubation is frequently to be considered a life-saving procedure, as in difficult thyroid cases, by permitting free and unhindered oxygenation. Further than this, the anæsthetist's responsibility includes the replacement of body fluids, and he must be an expert in the administration of intravenous fluids.

Today, the anæsthetist visits his patients for at least forty-eight hours after operation, playing his part in the early detection and prevention of pulmonary and other complications. In the further care of the seriously ill patient, in the early postoperative period, the internist again shares the responsibility of the case. In this arrangement, one sees the anæsthetist as a very active collaborator not only during the operative period but over a period of two to four days.

At this juncture it might be well to review briefly our personal experiences of the past few years and indicate reasons for preferring certain methods of anæsthesia.

Ten years ago, spinal anæsthesia was used almost exclusively in difficult abdominal cases. Today, we rarely use it and only under very special circumstances. It has especial advantage, I believe, in cases of suppurative appendicitis, where the presence of a quiet, flaccid abdomen and contracted intestine adds greatly to the safety of the operation. Its use has been largely discontinued in hernia repair because of bladder dysfunction occurring in some six cases, two of my own and four others, hitherto symptomless, and in which recovery of function was long delayed. Enthusiasm for this method has also been reduced because of the patients, though relatively few, who complain of back pain and weakness, headache and even leg pains afterwards. Considering the large number of cases that we have operated upon under spinal anæsthesia without untoward result and with the improvements in technique that are now used, spinal anæsthetic is still a most useful method to produce anæsthesia and relaxation.

For cases of major abdominal surgery, which are often time-consuming—resection of stomach and colon, common duct exploration, and the like—we now prefer cyclopropane, administered through an intra-tracheal tube, supplemented with intravenous curare. More than 150 cases have been operated upon using this combination, without a death. We are convinced that a wide margin of safety exists when this method is employed by one who is experienced with it. Patients leave the operating-room in much better condition, possessing a warm dry skin in contrast to the moist cold skin following a lengthy spinal, with a minimum of shock and reduction of postoperative complications.

The record for thyroid surgery in Winnipeg has been consistently good for many years and continues to improve. That we are able to report a series of 402 consecutive cases—many of which were extremely toxic and some bed-

ridden because of cardiac damage—without a death is evidence of this fact. In this series of cases of goitre surgery there has been no death since 1938. No improvement in surgical technique is responsible for this situation. Full credit for this satisfactory result must be given for the excellence of the preoperative medical management and the care and skill exercised in the administration of the anæsthetic.

As members of the medical profession, physicians, anæsthetists or surgeons, we must all be interested in the results of surgery, including its morbidity and its mortality. There can be no doubt that the end results of surgery are better than they used to be. Statistics available from all centres indicate this. Surgeons cannot claim that such important changes have affected their technique as to be alone responsible. No one will deny that the surgeons of twenty years ago were masters of operative technique nor would they yield in any way to their present day successors. Other measures, apart from actual surgery, such as closer collaboration with the internist in the management of major surgical problems; more thorough preoperative preparation; and safer anæsthesia, must be credited with much of what has been accomplished.

It is, furthermore, obvious that where mutual respect and harmony exist in the operating theatre between the surgeon and his capable ally, the anæsthetist, much can still be achieved in the elimination of what has hitherto been considered the final and irreducible degree of failure which mars surgical records.

A RECORD HIGH SOURCE OF ASCORBIC ACID.—Guava at 300 mgm. ascorbic acid per 100 gm., the fruit of the emblic tree at 800 mgm., and rose hips at 1,200 to 1,700 mgm. are extremely rich natural sources of ascorbic acid. It is now reported (C. F. Asenjo and A. R. F. de Guzmán, *Science* **103**: 219, 1946) that the West Indian cherry may contain as much as 3,300 mgm. of ascorbic acid per 100 gm. This cherry, weighing about 5 gm., is reported as the fruit of the tree commonly called "acerola" in Spanish, and is native to tropical and subtropical America. The variation in ascorbic acid appears to depend principally on the ripeness of the fruit. The green unripe berries contain from 2,500 to 3,300, medium ripe 2,500 to 3,000, and the ripe berries 1,000 to 2,700 mgm. %. These workers have furthermore isolated and identified pure l-ascorbic acid from the juice of these cherries.

Apart from the strictly nutritional aspects of the exceptionally rich natural sources of ascorbic acid, is the vexing question of the possible physiologic basis for such a high concentration. Could a study of the metabolism of rose hips and the West Indian cherry offer any particular advantages in the study of the function of ascorbic acid?—*Nutrition Reviews.*

IMMUNIZATION IN CHILDREN*

By J. H. B. Grant, M.D.

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OUR greatest endeavour should be expended in an attempt to actively immunize as many people as possible, and especially children, as it is in the early years of life that most infectious diseases are contracted.

In Canada most of the necessary products used in both active and passive immunization procedures are supplied free by various governmental agencies and are readily obtainable and very reliable.

Immunization will be considered in reference to the following diseases: That a very definite need still exists can be seen by examining Table I.

TABLE I.

CASES REPORTED BY PROVINCIAL HEALTH DEPARTMENTS TO THE DOMINION BUREAU OF STATISTICS, DURING THE YEARS, 1926—1944

Year	*Smallpox*	*Diphtheria*	*Measles*	*Scarlet fever*	*Whooping cough*
1926..	1,536	7,175	39,429	14,238	6,968
1927..	2,844	8,501	28,150	15,462	6,691
1928..	3,328	8,781	27,733	14,585	6,649
1929..	1,942	9,010	42,132	15,887	10,536
1930..	1,293	8,036	21,606	17,018	11,747
1931..	866	5,914	25,664	12,783	9,174
1932..	347	3,912	53,608	9,659	12,058
1933..	100	2,377	13,571	10,009	14,622
1934..	17	2,267	29,115	16,234	19,484
1935..	34	1,999	83,127	17,677	17,991
1936..	62	2,031	55,724	21,226	16,256
1937..	58	2,945	57,408	16,747	17,396
1940..	11	2,330	45,829	13,700	19,863
1942..	6	2,955	26,258	20,648	18,284
1944..	0	3,223	55,317	20,945	12,384

SMALLPOX

In Vancouver the subject of smallpox vaccination is a very timely one. For many years up to 1932 we had had frequent visitations of a mild form of smallpox with very little mortality. In 1924 and 1925 there were about 800 cases with only 1 death. Then in 1932 we encountered a much more severe form with 17 deaths in a total of 56 cases. During this epidemic about 80,000 persons were vaccinated in the city.

Since 1932 we have had only 5 to 10 cases; none at all since 1939. But in March 1946 an outbreak of a very severe form occurred in

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* Read at the Seventy-seventh Annual Meeting of the Canadian Medical Association, Section of Pædiatrics, Banff, Alberta, June 12, 1946.

Seattle, 150 miles away. The mortality in the first 30 or 40 cases was about 25%. The whole west coast became alarmed and people in Vancouver and other coast cities rushed to be vaccinated. The border between western Canada and western U.S.A. was closed to those who had not been vaccinated within a year and not a case appeared in Vancouver.

Between 100,000 and 150,000 persons were vaccinated in Greater Vancouver. We feel that our freedom from smallpox in 1946 was in a large measure due to the mass vaccination of our citizens acting on the prompt request of our Public Health Department.

Vaccination is now a familiar procedure, but perhaps it may be worth repeating that it should be performed before the child's 1st birthday, preferably from the 8th to 10th month of life. Immunity to smallpox is gradually dissipated and is completely lost in about 50% of children at the end of 5 years, so that vaccination should be repeated every 5 or 7 years, and in one and all in the presence of an epidemic of smallpox.

Vaccination is effective also if performed successfully 2 or 3 days after exposure to the disease.

DIPHTHERIA

This disease came next among our infectious diseases that can be controlled by immunization. The results are not 100% but with adequate doses of toxoid the great majority of children will obtain and hold immunity; also it has been found that should the disease develop in children so immunized, it will be much less severe than if no immunization had been attempted.

Two standard materials are offered for active immunization against diphtheria.

1. Alum precipitated toxoid—given in 2 or 3 doses, ½ c.c., 1 c.c., and 1 c.c. at 2 or 3 weeks' interval. This material will give a faster and a more lasting immunity but unfortunately the alum may produce a sterile abscess, and for this reason we adhere to the second potent agent.

2. Ramon's diphtheria toxoid given in 3 doses; 1st dose, ½ c.c., 2nd dose, ½ to 1 c.c.; 3rd dose, 1 c.c., at 3 week's interval. There is practically no reaction to this dosage in young children. All children should be immunized early in life, preferably in the first year, with a booster dose of 1/10 c.c. toxoid when child starts school, and every 5 years thereafter.

Routine immunization against diphtheria or reinforcement should be performed after 10 years of age, only after either a sensitivity or a Schick test, and doses modified as necessity requires.

The Schick test is a great help in checking the immunity level against diphtheria in the population at large. If it is positive there is not sufficient immunity present and the patient

TABLE II.

NUMBER OF DEATHS FROM CERTAIN DISEASES FOR CHILDREN UNDER 1 YEAR AND UNDER 15 YEARS, IN CANADA (I), 1926 TO 1944

	Meas'es		*Scarlet fever*		*Whooping cough*		*Diphtheria*		*Typhoid fever*	
Year	*Under 1 year*	*Under 15 years*	*Under 1 year*	*Under 15 years*	*Under 1 year*	*Under 15 years*	*Under 1 year*	*Under 15 years*	*Under 1 year*	*Under 15 years*
1926.....	263	854	25	313	773	1,232	47	850	1	99
1927.....	187	595	35	366	640	1,028	48	967	6	243
1928.....	89	316	25	285	469	724	48	859	6	107
1929.....	172	568	20	358	454	751	43	913	3	81
1930.....	212	510	30	330	686	961	49	680	1	92
1931.....	56	156	14	217	502	745	54	607	1	71
1932.....	119	310	13	172	339	550	27	366	1	75
1933.....	60	165	12	134	388	548	19	222	–	45
1934.....	73	183	7	202	605	869	11	217	3	55
1935.....	181	470	15	206	599	888	11	249	2	44
1936.....	115	344	11	194	392	589	11	228	–	45
1937.....	268	731	11	233	485	760	24	345	2	46
1938.....	91	236	13	171	334	495	20	405	–	34
1939.....	69	190	14	142	382	540	31	307	1	40
1940.....	68	151	6	96	472	625	12	196	1	36
1941.....	125	272	6	84	325	436	23	212	–	34
1942.....	52	114	10	94	413	557	26	233	1	18
1943.....	71	171	7	66	313	416	26	254	–	17
1944.....	95	224	8	88	239	336	28	273	–	16

Exclusive of Yukon and the Northwest Territories.

should be immunized, especially if exposure to the disease is at all likely. On the other hand if the test is negative there must be a definite degree of immunity, but this may not be enough to prevent the disease occurring in the event of exposure to a heavy dose of a virulent strain of the diphtheria organism. This immunity can be enhanced by the booster doses of toxoid.

That a very definite improvement has occurred in the mortality figures for diphtheria among Canadian children in recent years is shown in Table II.

The results shown in Table III for the City of Vancouver show a striking benefit from the use of diphtheria toxoid since large scale methods came into use about 1931.

TABLE III.

CITY OF VANCOUVER, B.C.

Year	*Diphtheria mortality rate per 100,000 population*	*Number of children immunized*	
1920	13.82		
1921	1.64		
1922	9.48		
1923	8.82		
1924	10.56		
1925	6.31		
1926	11.69		
1927	5.83		
1928	7.74		
1929	7.89		
1930	2.91	Toxoid commenced	
1931	2.02	continued	
1932	0.41	"	
1933	...	"	
1934	1.23	"	
1935	2.05	1,827	
1936	1.21	2,360	
1937	..	2,924	
1938	0.77	2,865	
1939	..	2,531	Reinforcing
1940	..	2,725	dose
1941	..	2,947	496
1942	..	3,610	652
1943	0.69	3,928	2,124
1944	..	3,572	2,013
1945	..	3,770	2,710

The above figures are of immunizations given by the City Health Dept. Staff and do not include procedures by private physicians. Records from 1930 to 1934 are very incomplete but work was carried on in the schools and child health centres quite extensively.

WHOOPING COUGH

Whooping cough now accounts for more deaths, in the first 2 years of life, than all the other infectious diseases combined. It is not uncommon in early infancy. About 75% of all whooping cough deaths occur in the first year of life. See Table IV.

A great deal of work has been done by Sauer, Kendrick, Strean and many others to produce a vaccine that will effectively immunize against this disease.

TABLE IV.

DEATHS IN CANADA—1942

	Disease				
	Typhoid fever	*Scarlet fever*	*Measles*	*Diphtheria*	*Whooping cough*
Under 1 year	1	10	52	26	413
From 1 year to 5 years	1	30	51	114	134
From 5 years to 15 years	16	54	11	93	7
Total all ages	92	129	131	256	560

Much of the vaccine[1] used in Canada is a suspension of Phase 1 strains of *H. pertussis*, prepared by Sauer's method. Usually injected at 3 weeks' intervals for a total of 6 c.c. fluid containing 90,000 million bacilli. Number of injections depends on age of child and degree of reactions. Reactions are usually a slight elevation of temperature and some tenderness and redness at site of inoculation.

Reinforcing doses of 1 c.c. can be given at end of 1 year and again at end of 2½ years, after completion of regular series. Immunity does not become solidly established until 3 or 4 months after the last injection of the regular series.

Experience over a period of years indicates that from 60 to 80% are protected for at least 5 years. In Sauer's own city of Evanston, Ill., from 1938 to 1945 no child that had been injected in Evanston, is known to have developed whooping cough.

The greatest problem we have today regarding whooping cough immunization is in relation to the very young infant. It is stated that infants under 6 months do not produce sufficient immunity reaction to either diphtheria or whooping cough vaccines to prevent these diseases on exposure. And again, in the case of whooping cough, that any immunity artificially induced in young infants is not enduring, or supposing that immunization is started, say at 1 month, the well established lag of 3 or 4 months previously mentioned brings the child to 6 or 7 months of age before immunity is established firmly—by this age 60% of whooping cough deaths have occurred. See Table V.

Sauer[1] states definitely that it has been firmly established that for infants less than 6 months of age only alum-precipitated pertussis vaccine

TABLE V.

BREAKDOWN OF DEATHS IN CANADA—1942

	Disease			
	Scarlet fever	*Diphtheria*	*Measles*	*Whooping cough*
Total.....	10	26	52	413
Under 1 month .	1	0	6	27
1 to 2 months...	1	5	5	64
2 to 3 months...	0	6	5	67
3 to 4 months...	1	2	2	45
4 to 5 months...	1	1	7	48
4 to 5 months...	1	1	7	48
5 to 6 months...	0	2	6	26
6 to 7 months...	2	0	5	27
7 to 8 months...	0	1	2	20
8 to 9 months...	0	1	6	26
9 to 10 months..	2	7	7	25
10 to 11 months.	0	7	7	17
11 to 12 months.	1	2	2	19

should be used, with a total dosage of about 45,000 million bacilli and that infants injected so early in life should be re-immunized soon after the 7th month. Dr. Ranta[4] in a recent review brings forward the question of immunizing the prospective mother, against whooping cough, in the middle semester of pregnancy.

In our routine immunization procedures at the present time we are using a combination of diphtheria toxoid and pertussis vaccine. The dosage of each material is the same as previously stated with a little difference in technique, *viz.* For infants over 6 months, three subcutaneous doses, each of 2 c.c. in each arm at monthly intervals. Under 6 months we divide the primary amount, making 4 subcutaneous doses. Reinforcing doses, 1 c.c. of combined vaccine subcutaneously at end of 1st years and end of 2nd years after initial course. Age of commencing combined injections should be from 4th to 6th month.

The benefit of combined solution is in the reduction of the number of injections needed in the immunization against these two diseases.

SCARLET FEVER

There is a great deal of argument as to the advisability of attempting to immunize against scarlet fever.

Susceptibility to scarlet fever may be determined by the Dick Test. Dick-positive children can usually be made Dick-negative by the weekly injections of increasing doses of scarlet fever toxin; 5 injections are usually given Many children show a considerable local and constitutional reaction to these injections and parents must be warned of these possible reactions. Many physicians object to using immunizing material that causes so much discomfort.

Other objectors point out that giving the toxin prevents the appearance of the rash in children that are nevertheless suffering from a streptococcus infection evidenced by sore throat and fever. These children so affected, if not quarantined, may spread the disease to other susceptible children.

On the other hand if the rash is merely one evidence of the effect of erythrogenic toxin as applied to the skin and if this toxin circulating through the body damages the kidneys, heart, etc. and if one can, by use of scarlet fever immunization prevent the systemic insult delivered by erythrogenic toxin the patient will have been done a great service.

One is safe in asserting that in institutions with patients and nurses exposed to scarlet fever and in the presence of an epidemic of scarlet fever in a community, immunization may be of great benefit. All Dick positive persons should be immunized in these circumstances. The age preferred for immunization should be after 1 to 2 years.

As seen from Table II, scarlet fever, during the years 1940 to 1945 has been quite prevalent in Canada, but the total number of deaths has been under 100 yearly, making a mortality rate from 0.4 to 1.4%. Chemotherapy has effected a marked improvement in the mortality rate.

TYPHOID AND PARATYPHOID FEVER

These diseases can be prevented by the use of T.A.B. vaccine, which has proved its efficiency beyond doubt in all wars since the Russo-Japanese war in 1906. The vaccine should be used for individuals usually above 2 years of age living in localities where typhoid fever is endemic, where the water supply is unpurified and the sewage system primitive, for members of typhoid sufferers' families, for institutional personnel, for travellers and for military forces.

Protection may last a long time but in many instances it is lost within a year or two and re-vaccination should be done at least every third year.

TETANUS

Immunity can be produced by tetanus toxoid. After immunization the protective antibody content of the blood serum possessed by the patient decreases as time goes on. Hence in

case of subsequent accident, especially in the country, a booster shot of ½ to 1 c.c. tetanus toxoid should be given. This takes the place of the usual dose of tetanus antitoxin injection in those exposed to the disease.

Age to immunize, 9 months to 3 years, re-inoculation to be done at time of re-exposure to this disease and this may occur at any age.

Tetanus toxoid is gradually gaining in popularity since it was first introduced by Ramon in 1923. It may be combined with diphtheria toxoid or with T.A.B. vaccine. It is especially of importance to country dwellers where the exposure to tetanus is much more apt to occur.

PASSIVE IMMUNIZATION

1. *Diphtheria.*—One thousand units of diphtheria antitoxin may be given to persons of any age that have been exposed to diphtheria. The passive immunity produced may last from 10 days to several weeks but it is not safe to trust to it after two weeks. It is a horse serum product and should be used very carefully and sparingly. It is of special use in country practice. Injections to be given intramuscularly, after testing for sensitivity.

The immunity of contacts who have had former toxoid may be raised by giving a booster dose of toxoid, which is greatly effective in the majority of cases. This may obviate the use of prophylactic antitoxin.

2. *Scarlet Fever.*—Three thousand units of scarlet fever antitoxin will usually prevent scarlet fever in those exposed if given within 1 to 3 days after exposure. Same dose at any age. Again, there is the use of a horse serum which will sensitize the patient and again, there is very little reason for injecting this serum for prophylaxis, especially in the face of the relatively mild scarlet fever that has been prevalent this past few years. The passive immunity when produced lasts only about 10 days.

Prevention of scarlet fever after exposure can often be effected by the use of sulfonamide drugs if given in the first day or two after contact.

3. *Tetanus.*—Fifteen hundred units tetanus antitoxin subcutaneously as soon after the injury as possible, especially where wound is deep and has been contaminated with soil, street dust, manure, etc. May be repeated after 7 days in severe or very dirty wound. If previously immunized, give booster dose of tetanus toxoid at time of accident.

4. *Measles.*—Convalescent measles serum or placental globulin extract if given in sufficient amount and early will prevent measles in most cases, but since exposure often occurs 3 or 4 days before the rash appears the serum is rarely given in time for complete protection.

If complete protection is desired in very young or sickly children, 10 c.c. of convalescent serum must be injected intramuscularly on or before the 5th day after exposure. The passive immunity thus produced lasts only a few weeks.

In well children above the age of infancy, the objective should be to modify and not to prevent the disease. The above dose should then be given on the 6th day after exposure and not later than the 8th day. Permanent immunity does not invariably follow modified measles.

CONCLUSIONS

1. Excellent results have been obtained from the active immunization against smallpox and typhoid and paratyphoid fever. One hundred per cent immunity can be produced if vaccination and re-vaccination are carefully performed as needed.

2. Diphtheria can be prevented in the vast majority of children by the use of toxoid, reinforced by booster doses every 5 years.

3. Whooping cough vaccine is of definite value but there remains the problem of the very young infant.

4. Scarlet fever immunization has a very definite place but its general acceptance by physicians and parents has not yet come to pass.

5. Tetanus toxoid has not yet come into widespread use but is very effective.

6. For passive immunization: (*a*) Diphtheria and tetanus antitoxin will effectively prevent these diseases, if given in time. (*b*) Scarlet fever antitoxin has been replaced to a great extent by the sulfonamide drugs. (*c*) Convalescent serum has a definite value in measles.

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CASE REPORTS

BRONCHIAL ADENOMA

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These pulmonary neoplasms are being reported with increasing frequency within the past ten years. Although Jackson, Konzelmann and Norris[1] in 1945 reported three cases of bronchial adenoma which they had had under observation for over twenty years, the correct ante-mortem diagnosis was still rarely made in 1928 when Myerson[2] reported a case of fibrolipoma of the left main bronchus removed through the bronchoscope. A comprehensive review of the literature has been published by Riordan and Richards.[3]

The purpose of this paper is to add two more case reports of so-called bronchial adenoma, to discuss the clinical, diagnostic and pathological features of this type of polypoid tumour, and to indicate their therapeutic management.

CASE 1

M.M., a white female, aged 36 years, was admitted to the Saint John Tuberculosis Hospital on October 4, 1943. Since 1934 she had had recurring attacks of chills and fever about once a year. In 1939, when she first consulted a physician because of slight cough and sputum which was at times blood streaked, her temperature was 104°. She was told she had a right-sided pleurisy with effusion, remained in bed six weeks and returned to work after four months. In November, 1940, she again became ill with chills, fever, slight cough and sputum, remained in bed two weeks and then returned to work. In February, 1941, February, 1942, and December, 1942, she developed similar symptoms which lasted a few weeks each time. In May, 1943, she again had chills and fever with considerable cough and sputum which was accompanied by blood-spitting for four days. The blood was at first dark, then bright red and was coughed up with very little sputum. On July 7, 1943, a chest roentgenogram was taken for the first time, the patient then being referred to this hospital for investigation. Since July 12, 1943, she has been well with no symptoms except some oppression in the chest when fatigued.

On admission she appeared healthy. Height 64 inches; weight 195 lb.; temperatre 98.2; pulse 66; blood pressure, systolic 130, diastolic 84. The only abnormal physical finding was present in the right posterior thorax where the percussion note was impaired in the lower third and the breath sounds diminished over the same area.

Laboratory data.—Hæmoglobin 68%, erythrocytes 3,500,000, leucocytes 9,300. Differential: polymorphonuclears 52%, lymphocytes 46%, eosinophils 2%. Sputum, mucopurulent, 1 to 3 dr. in 24 hours, negative for tuberculosis. Urine normal. Kahn negative. Sedimentation rate (Westergren) 17.5 mm. Tuberculin skin tests, negative. Chest roentgenogram on October 5, 1943, postero-anterior (Fig. 1) and right lateral (Fig. 2) showed a circular opacity on the right side, posteriorly situated, with an area of atelectasis distal to it. Bronchogram on October 7, 1943, revealed a lack of filling of the bronchus to this area.

Bronchoscopic examination was performed by Dr. L. Macpherson on October 12, 1943. Trachea, carina and right main stem bronchus were normal. The middle lobe and lower lobe bronchial orifices and spur were normal, but bleeding, which appeared to come from the superior segmental bronchus of the lower lobe, was encountered. On October 14, a diagnostic pneumothorax was instituted and a free pleural space found. On November 3, an exploratory right thoracotomy was performed by Dr. G. F. Skinner and Dr. L. Macpherson. The right lower lobe was markedly shrunken and atelectatic in the posterior lower portion. Just below the hilus in the lower lobe was a hard rounded mass, about one and one-half inches in diameter. The lower lobe was removed by individual hilar ligation.

Pathological report from Dr. A. Branch, Provincial Laboratory was as follows, "section right lower pulmonary lobe. Portion of what appears to be base of lung 10.5 cm. diameter, with ragged pleura, containing a firm encapsulated nodule 4 cm. in diameter. On section it has a homogeneous pale yellow colour. Microscopic: Sections show tumour to be composed of masses of cuboidal epithelial cells arranged partly in alveolar fashion and partly in solid cords. There is a loose stroma around the clumps of cells but not between them. Here and there more dense fibrous tissue is seen in

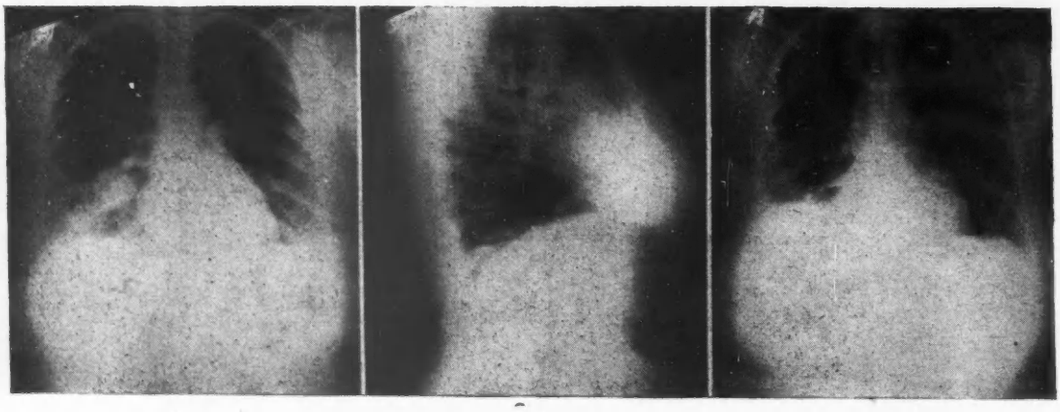

Fig. 1 Fig. 2 Fig. 3

Fig. 1. (Case 1).—October 5, 1943. Postero-anterior. Circular opacity on right with distal atelectasis. **Fig. 2.** (Case 1).—October 5, 1943. Right lateral. Opacity and atelectasis situated posteriorly. **Fig. 3.** (Case 1).—March 28, 1944. Postero-anterior. After right lower lobectomy.

strands and in one place a piece of cartilage. No mitoses were found. Diagnosis—Adenoma."

The specimen was then sent to the Army Medical Museum, Washington, and their microscopic report is: "Microscopic: Section reveals fragments of neoplasm made up of nests of small homogeneous cells containing moderately hyperchromatic nuclei and showing rare mitotic figures. Portions of the stroma are mucoid or hyalinized. In places the tumour appears encapsulated. In other areas it invades the stroma in small nests. Diagnosis: So-called adenoma of bronchus."

This patient made an uneventful recovery and was discharged December 15. A chest roentgenogram, March 28, 1944, (Fig. 3) shows partial removal of the fifth rib and disappearance of the former opacity in the right lung. She has remained well.

CASE 2

M.H., a white female, aged 34 years, was admitted to the Saint John Tuberculosis Hospital on June 23, 1944. She gave a history of frequent head and chest colds during the winter months for as long as she could remember. In October, 1943, she had a brisk blood spitting, with sudden onset and stoppage. She immediately consulted a physician, at which time her temperature was 103°. She then spent one month in a sanatorium, where several chest roentgenograms were taken, and she was told she had not tuberculosis but pneumonia. On discharge she resumed her work, feeling well until February 14, 1944, when she again had brisk blood-spitting lasting five hours. After remaining in bed one day she felt well and resumed working. On May 27, she again had a brisk bleeding. On May 30, another chest roentgenogram was taken and she was referred here for consultation and treatment. Since May 27, she has had an irritating cough but feels well and has not lost weight. On admission she appeared healthy and well nourished. Temperature 99°; pulse 90; blood pressure, systolic 104, diastolic 50. The only abnormal physical findings were confined to the right posterior thorax, where the percussion note was dull in the lower third with markedly diminished breath sounds over this area.

Laboratory data.—Hæmoglobin 74% (11.54 gm.), erythroccytes 3,850,000, leucocytes 12,600. Differential.—Polymorphonuclears 57%, lymphocytes 35%, monocytes 5%, basophils 3%. Urinalysis, normal. Kahn, negative. No sputum.

Chest roentgenograms.—On October 14, 1943 (Fig. 4) there is obscuration of lower right lung from diaphragm up to lower border of third rib, with greater density medially and increasing aeration laterally. On November 13, (Fig. 5) a circumscribed opacity is evident in the fourth interspace, on the right side. There has been clearing of the previous homogeneous density.

Bronchogram of June 27, (Fig. 6) shows lack of filling of posterior basic segment bronchus to this area of opacity. A bronchoscopic examination was performed by Dr. Macpherson on July 7, but such profuse bleeding occurred on touching the tumour that a satisfactory specimen could not be obtained. He repeated the examination on July 18. Only the right bronchi were entered and the shiny and round tumour mass was seen to be in the basal bronchus. This tumour appeared to move up and down with coughing. A specimen was removed, and copious bleeding again occurred.

Pathological report from Dr. A. Branch, read: "Section—intrabronchial tumour. Microscopic: This is a neoplasm which impresses one as being of the adenomatous type rather than a carcinoma."

On September 13, a right lower lobectomy was performed.

Pathological report from Dr. A. Branch. "Right lower pulmonary lobe; showing fibrous adhesions on the interior surface. Only atelectasis seen in the posterior portion. Main bronchus has been opened by surgeon to expose intrabronchial mass 2 x 4 cm. which is attached to a wide pedicle. Invasion does not appear to have extended beyond the bronchus. There is some yellow muco-pus localized in the bronchus below the tumour.

"*Microscopic.*—Two sections examined of the tumour and its attachment to the bronchus. The tumour is composed of small uniform cells arranged in alveolar fashion with fine trabeculæ. There are no mitoses and no extensions into the cartilage which is surrounded. The bronchi are dilated and surrounded by collars of lymphocytes and there is contiguous atelectasis of the lung parenchyma. Diagnosis: Bronchial adenoma with extension into wall."

This patient's postoperative course was uneventful and she was discharged October 16. She has remained well.

These bronchial adenomas occur more frequently in females than in males. In Brunn and Goldman's[4] series of 14 cases, 64% were females. Symptoms usually develop under 40 years of age, while 90% of the victims of bronchial carcinoma are over 40, according to Weber.[5]

A history of recurring attacks of pulmonary infections with long intervals of good health, as in our first case, is very suggestive of a benign intrabronchial tumour. Sudden brisk

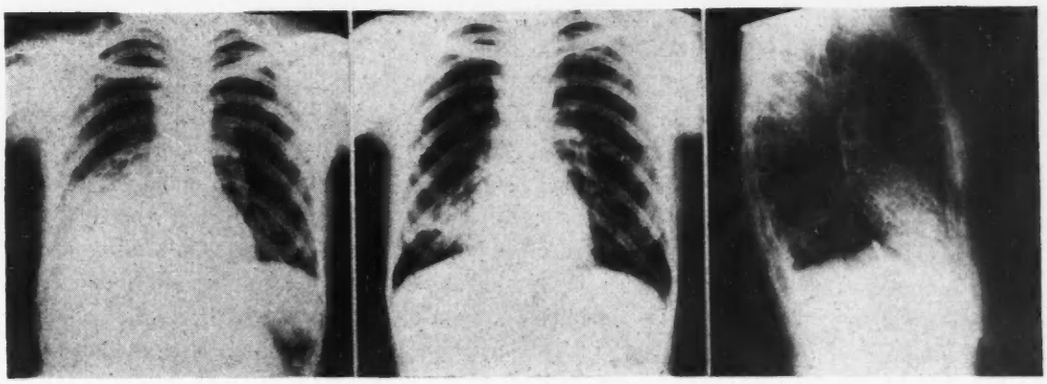

Fig. 4 Fig. 5 Fig. 6

Fig. 4. (Case 2).—October 14, 1943. Postero-anterior. Homogeneous density right lower lung field. **Fig. 5.** (Case 2).—November 13, 1943. Posterior-anterior. Circumscribed opacity in right lower lung field. **Fig. 6.** (Case 2).—June 27, 1944. Right lateral. Bronchogram. Lack of filling of posterior basic segment bronchus. Area of atelectasis situated posteriorly.

bleeding, the presenting symptom in our second case, may be the first symptom. This bleeding often begins and ends abruptly. In women the pulmonary bleeding has at times coincided with the menses. The hæmoptysis is usually copious, in contradistinction to the streaking which occurs as a later symptom in bronchial carcinoma. Both Brunn and Goldman[4] and Ralph Adams[6] have stressed the difference in character of the pulmonary bleeding in these two types of neoplasm. In Jackson's[2] series of 20 cases of bronchial adenoma, 12 had hæmoptysis, and 2, streaking. In the case reported by Riordan and Richards,[3] recurrent hæmoptysis had been present for twenty years before a diagnosis of bronchial adenoma was made by bronchoscopic biopsy.

If this tumour produces a partial obstruction of the bronchus, wheezing and asthmatoid symptoms may be the initial complaint. With interruption of normal bronchial drainage there may develop a distal pneumonitis or "pneumonia" or bronchiectasis or lung abscess. Empyema may result. Complete obstruction of the lumen of the bronchus will produce a distal atelectasis. If the pulmonary suppuration is not overwhelming these patients may continue for years in a state of good nutrition. Some succumb to the pulmonary infection, the diagnosis of bronchial adenoma being made on post mortem examination.

DIAGNOSIS

If sufficient time and consideration is given to obtaining a complete history much valuable information is received, as illustrated in our first case. The symptoms are not diagnostic, as similar ones may be produced by many bronchial tumours and by many pulmonary diseases. Tempel,[7] in his very complete outline of the diagnostic criteria of chest tumours, says the important thing to remember is to consider tumours as well as an inflammatory process as the cause of symptoms. Roentgenological examinations, which should include fluoroscopy as well as positional films, will show some pulmonary abnormality. Rarely, if ever, will this examination be negative when the patient consults a physician because of symptoms. If a circumscribed opacity is seen, a lung tumour is immediately considered. However, the findings may be an atypical pneumonia, as in our second case, a pneumonitis, an area of atelectasis or localized emphysema, a lung abscess or empyema. Further investigation is then indicated to determine the cause of the abnormal chest roentgenogram.

The bronchogram may show localized bronchiectasis or there may be evidence of bronchial obstruction, as in both of our cases. Weber[5] considers a "cap-shaped" deformity of the bronchial outline, due to a layering of the opaque oil over the round, smooth intrabronchial mass, characteristic. Sputum examinations and hæmograms are a routine procedure today, but are not specifically contributory in establishing the diagnosis of bronchial adenoma. The bronchoscopic examination showing a smooth, rounded, pinkish or purplish polypoid tumour, when seen, is characteristic. However, the vascularity of the tumour which bleeds so readily, may prevent the obtaining of a suitable biopsy specimen. In our first case no specimen was obtained, while in the second case, a second bronchoscopy was necessary before satisfactory tissue for biopsy could be removed. A positive diagnosis of bronchial adenoma was made from this biopsy. A bronchoscopic biopsy affords the only means of establishing a definite preoperative diagnosis of bronchial adenoma.

PATHOLOGY

In their table of classification of polypoid bronchial tumours according to growth potential and microscopic appearance, Brunn and Goldman[4] categorize the adenoma as a local epithelial tumour without metastases. Graham and Womack[8] suggest that these tumours may have a common origin with such connective tissue tumours as chondroma, osteoma, fibroma, lipoma, angioma, myxoma and sarcoma, all being derived from disorganized embryonic bronchial buds.

These bronchial adenomas are found in the lumen of the larger bronchi. Three morphological types have been described, a pedunculated endobronchial, a second with a larger intramural portion and a third "extra-endobronchial" in which the extrabronchial portion is larger than the endobronchial.

Grossly, they have a smooth, rounded pink to purplish appearance and are soft and vascular. Microscopically, they are covered by bronchial epithelium, which may have undergone squamous metaplasia. The cells are small and uniform, cuboidal or polygonal in shape, and arranged in alveolar or cylindromatous

patterns. The appearance and arrangement of the cells, as just described, was found in each of our cases and is considered characteristic. The stroma is composed of fibrous tissue and blood vessels. Mitoses may be present in the capillary endothelial cells but there is no evidence of "unruly growth".

These tumours grow slowly, but eventually as a result of the bronchial obstruction and subsequent pulmonary suppuration produce fatal results. Jackson *et al.*[1] concede that these tumours may undergo malignant change but have not observed this in their series. Adams, Steiner and Bloch[9] in 1942 reported five cases of "malignant adenoma of the lung". They found tumour cells in regional lymph nodes, invasion of the bronchial wall or distant metastases. One case had true metastases in the liver and another in a lumbar vertebral body.

Anderson[10] in 1943 reported a case having a history of eight years' duration before dying, following a sudden attack of dyspnœa, within four days of admission to hospital. The autopsy revealed a large bronchial adenoma arising in the right main bronchus just below the bifurcation of the trachea, and a nodule in the liver, which on microscopical examination was composed of tissue identical with that found in the tumour of the bronchus. Graham and Womack[8] in 1945 added another case to their seven previously reported in 1938 in which invasion of adjacent tissues or involvement of regional lymph nodes had occurred. Their eighth case had remained "benign" for twenty years before succumbing. Post-mortem examination was then reported as showing "a large mass of cancerous tissue in liver and lung".

It would appear that although histologically these tumours may be considered "benign" some will eventually manifest evidence of malignancy by invasion of adjacent tissues, by involvement of regional lymph nodes or by distant metastases.

TREATMENT

The morphological characteristics of these tumours are such that one cannot be assured of complete endobronchial removal. As there is now sufficient evidence of the "potentially" malignant nature of these adenomas, complete extirpation of the tumour mass is desirable. In order to accomplish this, the lung lobe in which the tumour is situated should be removed. Chamberlain and Gordon[11] advise also the removal of mediastinal glands at the time of operation, as they are occasionally involved. In their presentation of results in ten cases of bronchial adenoma, they encountered lymph node involvement in five cases. In neither of our cases were enlarged glands found at time of operation.

An additional indication for lobectomy exists if there is localized bronchiectasis or chronic pulmonary suppuration distal to the tumour. In our first case the lower lobe was markedly shrunken and atelectatic in the posterior lower portion. In both cases yellow muco-pus was present in the bronchus below the tumour. With the development of a relatively safe technique for pulmonary resection, lobectomy is considered the treatment of choice in these cases.

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PROGRESS REPORT ON A CASE OF AURICULAR FIBRILLATION DEMONSTRATED IN AN INFANT OF THREE MONTHS

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Montreal

In 1935 we observed an infant, aged 3 months, in whom auricular fibrillation had been present probably since birth and perhaps before birth. We reported the case in 1938.[1] A thorough search of the literature has revealed no other case of this kind before or since. Recently Eideken and Rugel[2] described a rare type of "fleeting paroxysmal auricular fibrillation" in an infant of 3 months in whom auricular fibrillation occurred in the diastolic period between two normal sino-auricular rhythm beats. In our case, which was of the usual persistent type, neither quinidine nor digitalis therapy had any effect on the auricular rhythm, which became normal spontaneously when the child was about one year old.

An electrocardiographic record showing normal rhythm was made in 1936.

The child was next seen by one of us (H.N.S.) on June 28, 1944. There had been no recurrence of auricular fibrillation. When the child was thirteen months old, gastrostomy had been performed for the removal of an open safety pin. At the age of 7 years, she had a severe "streptococcus sore throat" and was treated with sulfonamides. She had a high fever for three days and was ill for a week. Later in the same year, she had chickenpox. She had not had any other illness. Her habits and behaviour were those of a normal child of 9 years. Physical examination revealed her to weigh 59 lb.; her weight was 53", one small lymph node was felt on each side of the neck. All other clinical signs were within the normal range for her age. The cardiac apex was felt 6 cm. to the left of the midsternal line in the 5th intercostal space. At the apex in the left lateral recumbent posture, a short, coarse auricular sound was heard preceding the first sound and a slightly rumbling third heart sound was heard after an interval of quiet following the second sound. The third sound was heard as a somewhat shorter thud at the apex with the patient in the dorsal recumbent posture. There was also a rather coarse, short systolic murmur, restricted to the interval between the first and second sound, loudest at the aortic area but heard also along the left border of the sternum and at the apex. These features were considered as within the range of normal. The blood pressure was 100 systolic and 60 diastolic.

Fluoroscopic examination of the chest revealed no abnormalities in the lung fields. The heart was of normal shape and size. The measurements were: aortic arch 3.3 cm., right border 2.9 cm., left border 6.2 cm., transverse diameter of chest 20.0 cm. There was no evidence of left auricular enlargement in the posterior mediastinum and the pulmonary conus was well within the normal range. Electrocardiogram revealed sinus arrhythmia, rate 90 to 116, P-R interval 0.16 of a second QRS 0.08 of a second. Normal electrical axis. Juvenile type of T waves in Leads CF-2 and CF-4. This record revealed no abnormalities.

She was last examined (H.N.S.) on April 10, 1946. Her general appearance was that of a normal, healthy girl of 11 years. She was in 5th grade at school and engaged in the usual

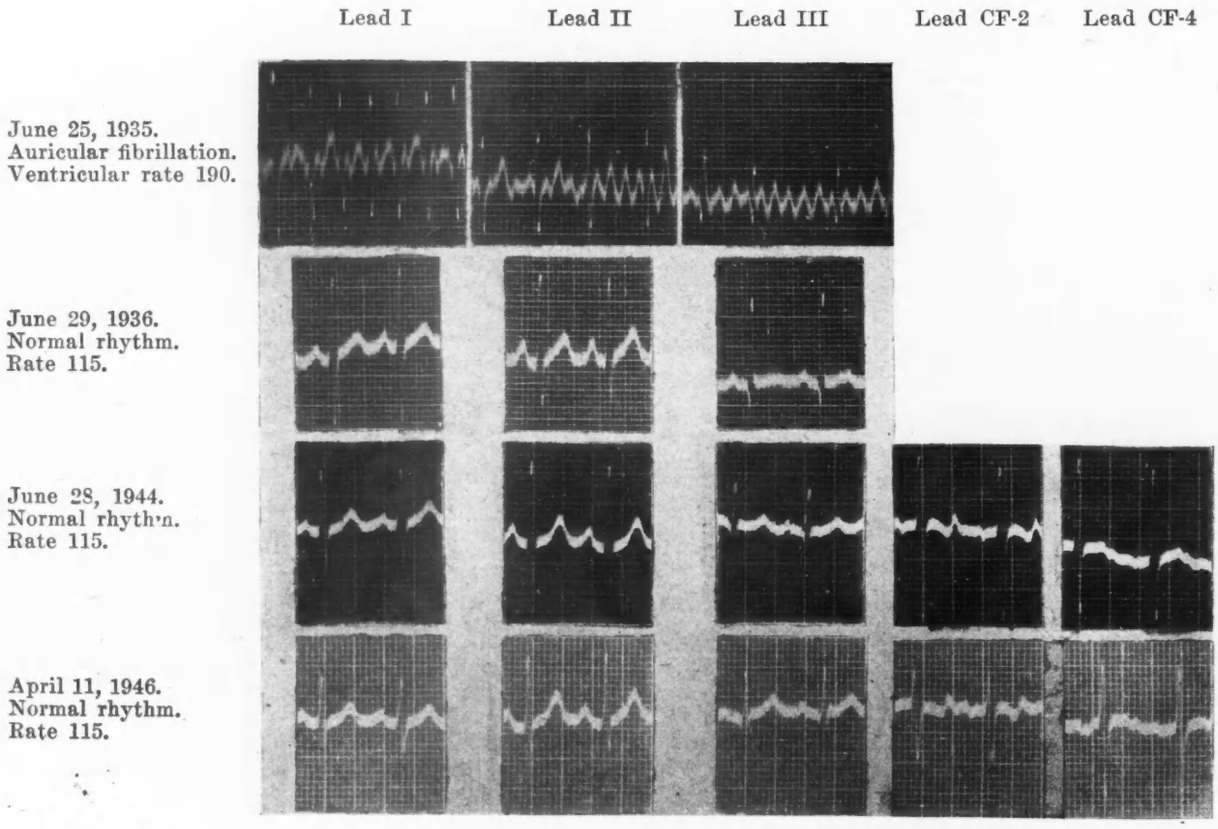

Fig. 1.—Electrocardiogram of June 25, 1935, reveals auricular fibrillation with coarse auricular waves. Subsequent electrocardiograms reveal normal rhythm with slight variations in amplitude and shape of Q.R.S.T. complexes related to normal growth.

childhood sports, including riding a bicycle. She had not had any acute illness. By percussion, no evidence of cardiac enlargement could be established. The cardiac apex was maximal in the 5th left intercostal space, 6 to 6.5 cm. from the midsternal line. The heart sounds were of good loudness and quality. During inspiration only, the second sound was everywhere duplicated, its earlier part being a loud sound and its latter part a faint, short sound. No third sound or diastolic murmur could be detected. A short, coarse, crescendo, somewhat superficial systolic murmur was heard at the left border of the sternum near the 4th intercostal space in the sitting posture only. At the apex, in the sitting and left lateral recumbent posture, a very faint, short systolic murmur between the first and second sounds could be detected. A similar systolic murmur was detected at the aortic area. The blood pressure was 112 systolic and 80 diastolic. The electrocardiogram (Fig. 1) recorded in the dorsal recumbent posture revealed normal rhythm, rate 115, P-R interval 0.16 of a second QRS 0.06 of a second. Normal electrical axis. The S wave in Leads I and II was of lower voltage than it was in 1944, when it also showed lower voltage than the records of 1936 and 1935. The R wave in Lead III was of about the same voltage as in 1944 but lower than in 1936. The chest leads, CF-2 and CF-4, were similar to what they were in 1944. The tachycardia was of the functional type as the child was in a state of moderate tension at the time. The new features of the heart sounds and murmurs may be ascribed to variations which occur with growth. The auricular and 3rd sound had disappeared.

This patient had auricular fibrillation early in infancy, probably at birth and, once normal rhythm had been established at about the age of one year, there were no recurrences of auricular arrhythmia. When she was first observed to have normal rhythm in 1936, it was supposed that she might very well have recurrences of auricular arrhythmia such as auricular premature beats, auricular flutter or auricular fibrillation, etc. at some time in the future. This has not happened in the past ten years but must be considered as a future possibility.

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SITUS INVERSUS*

By A. M. Vineberg, M.D., M.Sc., Ph.D. and Michael M. Aronovitch, M.D., F.R.C.P.[C.]

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The incidence of complete situs inversus has never been accurately estimated. Bauer in 1942 quotes various authors who give figures ranging from 1:2,000 to 1:35,000. Larson in 1938 thought the incidence was about 1:10,000. At that time Larson stated about 475 cases had been reported in the literature. The condition is usually said to occur about twice as frequently in men as in women, although Cockayne did not find this in his series. The higher incidence in men is probably due to the greater frequency of routine examinations of men as for insurance, industry and armed forces.

Cockayne in 1938 after a study of family pedigrees came to the conclusion that complete transposition of the viscera is inherited as a recessive and is determined by a single autosomal gene. The majority of his patients were right-handed although some were left-handed and two were ambidextrous.

Two theories concerning the etiology have been proposed. One suggests that the condition is due to the survival of one of two twins. According to the other theory the thoracic and abdominal organs are at first median and symmetrical. Transposition of the viscera consists of the formation of a sinistral instead of a dextral spiral. This latter theory seems much the more reasonable one.

Any disease which occurs in normal individuals may occur in people with situs inversus. However, congenital abnormalities rank high and the Kartagener triad of situs inversus, sinusitis and bronchiectasis, has become familiar since Adams and Churchill brought it to the attention of the American literature in 1937. Kartagener had written about the association of these conditions in 1933. Of abdominal conditions appendicitis has been frequently described and gallbladder disease occasionally. The symptoms described were not always on the same side as the diseased organ.

In the literature we have found only two cases of peptic ulcer. One of these had perforated

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and was operated on. No mention is made as to the localization of the pain. In the other there was pain and tenderness in the epigastrium referred neither to right nor left. No record of gastrectomy in any case of situs inversus could be discovered. The following case seems to be the first in which gastrectomy was performed.

CASE HISTORY

O.G., a 34-year old sergeant, was admitted to the Medical Service of Montreal Military Hospital on March 22, 1944 complaining of a heavy sensation in the upper abdomen, accompanied by belching and heartburn, relieved by milk and alkalies. Symptoms had been present for about a year. There had been some vomiting 10 days before admission. He had been in hospital previously in 1930 for an appendectomy when situs inversus was discovered. He had had gastric complaints off and on since 1933 for which he was x-rayed in 1937 when no ulcer could be found on barium series.

The family history was irrelevant except that the father had died of carcinoma of the stomach at the age of 45 years.

Physical examination showed the heart dullness to be to the right of the sternum. Sounds were normal. Blood pressure 150/110. The abdomen was symmetrical and showed an old mid-line incision below the umbilicus. Liver dullness was on the left side. The right testicle was lower than the left. Physical examination was otherwise negative. Electrocardiogram showed the typical findings of dextrocardia with complete inversion of all complexes in lead I. An electrocardiogram was then taken with leads reversed in the arm and on the right instead of the left leg. This electrocardiogram was normal except for slight left preponderance and some Q.R.S. changes compatible with his hypertension and body build (Fig. 1).

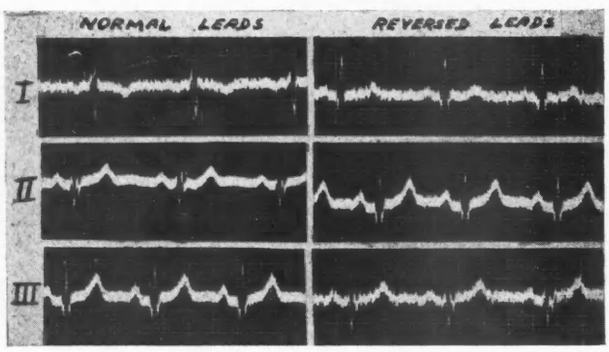

Fig. 1.—Tracing taken with usual leads and with reversed leads. The first tracing is typical of situs inversus. The second one shows the findings one might expect in hypertensive cardio-vascular disease.

X-rays taken March 23, revealed complete situs inversus (Fig. 2). The barium series showed the stomach to be high in position on the right side with moderately coarse tortuous rugæ. The duodenal cap was very spastic and did not fill out well at any time during the examination. An ulcer crater was present in the pyloric antrum in the immediate prepyloric region on the greater curvature side. There was some pylorospasm and coarsening of the mucosal pattern in the duodenal loop (Fig. 3).

Gastric analysis showed hyperacidity in the fasting specimen. The test meal was otherwise not remarkable.

He was put on a Sippy diet with the use of aluminum hydroxide gel but his symptoms became worse.

When re-x-rayed on April 17, the barium series was essentially similar to the first examination with the exception that the ulcer crater seemed more prominent. The appearance at that time suggested that the crater lay at the tip of a diverticulous pouching of the pyloric antrum. The duodenal cap was not grossly deformed nor was there evidence of crater formation. Aluminum hydroxide gel in continuous drip with milk was now tried but gave very unsatisfactory results. X-ray taken April 27, showed an apparent increase in

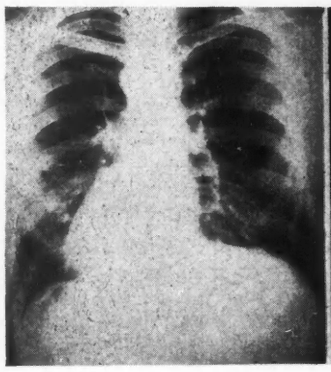

Fig. 2 **Fig. 3**

Fig. 2.—Transposition of the thoracic viscera. The stomach bubble can be seen on the right side. The hemi-diaphragm on the left is higher than the right and the solid shadow under it is indicative of liver.

Fig. 3.—Another view during the barium series. The arrow points to the ulcer.

the size of the ulcer crater. It was obvious that medical treatment was not helping him and he was then transferred to the surgical service. Delay occurred in operation while permission was being obtained for gastrectomy. X-rays taken May 18, were essentially similar to previous ones except that the duodenal cap was again spastic.

Operation report.—Under spinal anæsthesia a mid-line incision was made from the ensiform cartilage to the umbilicus. The stomach was found to lie in the right upper quadrant. The gall bladder and lobes of the liver appeared to be normal except for their left sided position. The ligament of Treitz and the jejunum were to the right of the mid-line below the mesocolon at about the level of the third lumbar vertebra. The ulcer was found to be lying on the lesser curvature of the first part of the duodenum about one inch beyond the pylorus. At this site there was considerable scarring, with adherence to the pancreas. The stomach was removed by the Hofmeister-Finsterer technique which presented no unusual difficulties or problems excepting for the reversed position of the stomach.

The postoperative course was uneventful. X-rays taken July 6, still showed some coarsening of the ruga in the remaining portion of the stomach and duodenum. The man has been back at work and feels well since his discharge from hospital July 7.

SUMMARY

A case is presented of situs inversus with duodenal ulcer for which subtotal gastrectomy was successfully performed.

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SPECIAL ARTICLE

PHYSIOLOGICAL CONSIDERATIONS OF THE ETIOLOGY AND TREATMENT OF OBESITY

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ETIOLOGY

Obesity is due to an excessive deposition of fatty tissue. This, in turn, is due to a disproportion between the energy intake in the form of food and the energy output in the form of work. The question arises whether this disproportion is the result of an excessive intake of food or of a subnormal output of energy. Newburgh, Evans, as well as many other, claim that it is invariably due to an excessive food intake. Others, on the other hand, contend that the fault is usually that of the energy output, and cite examples of people who gain weight when they do not overeat and of others who fail to lose weight when they are underfed. There has therefore been a continued search for some metabolic abnormality in obese people.

Energy metabolism. — It is the widespread opinion that a very large proportion of obese people gain weight because of a subnormal energy expenditure, which is reflected in a low basal metabolic rate. However, the belief that the B.M.R. is low in obese subjects has been shown to be erroneous. Boothby and Sandiford[1] measured the basal heat production in 94 obese patients, and found that in 81% the B.M.R. values were within 10% of the normal. In only three instances did the rates fall between, –16 and –20%. Furthermore, one patient exhibited a B.M.R. of +16%. Among 180 cases of extreme obesity Grafe[2] found only 3 in which there was a definite decrease in the B.M.R. Normal B.M.R. values in the majority of obese people have also been reported by Means,[3] Dubois[4] and others. It is therefore apparent that the occasional moderately low rate (*i.e.*, –15 to –25%) exhibited by an obese person does not enlighten us as to the etiology of obesity, since equally low rates are encountered as frequently among persons of normal weight. The few with very low B.M.R. values probably suffer primarily from myxœdema.

Not only does one fail to find the basal metabolism low in obese people, but observations have been made repeatedly that the basal calories per day are higher in the obese than in normal. In the former they lie between 2,000 and 2,200 as compared with 1,400 to 1,600 in the latter. But, since it has been demonstrated by Means[3] that the increase in surface area in the obese is proportional to their greater basal oxygen exchange, their B.M.R. determined in this way is normal despite the higher level of oxygen exchange. However, the total heat produced by the obese person in the basal state is greater actually than the total heat produced by normal people. Therefore, if one should relate the O_2 consumption to the ideal, not the actual, weight and surface area, one will find a high level of O_2 exchange in relation to the active vital body tissues of the obese as represented by their ideal weight. On the basis of such calculations, many obese will exhibit B.M.R. values as high as +25 to +30%. The level of O_2 exchange of the obese in excess of that which would be normal for their ideal weight is considered by Strang and Evans[5] as a measure of the physiological strain of their excess weight. Proof of this point of view is afforded by the fact that when the obese attain a reduction of weight by diet alone there is a concomitant lowering of the O_2 exchange, presumably by removal of the added work.

Newburgh and his co-workers[6, 7] went further and devised a method of calculating the dissipation of energy for any desired length of time without curtailment of activity. This method is based on the insensible loss of weight due to evaporation of water from the skin and lungs and the heat lost in this way. They investigated normal and obese cases of various types. In no case of obesity did they find anything unusual about the total metabolism. The obese did not exibit any capacity to live at a lesser expenditure of calories than normal. In fact, just the opposite was true. Their total expenditure of energy was large and this indicated that they produced considerably more heat than did normal persons of the same height, age, and sex whose weight was normal. The findings were in accord with those of Lauter[8] who demonstrated that an obese subject requires more energy to perform a given piece of work than does a normal control.

Specific dynamic action.—A person loses more heat after consumption of food than before. It is known that this response is not caused by digestion or absorption, since the increased heat loss is equally great after the intravenous administration of glucose or of some of the amino acids as after the ingestion of an equal quantity of carbohydrate or protein. It has furthermore been shown that this specific dynamic action is greatest after the consumption of protein.

It has been claimed by some that many persons gain weight because of an abnormally low specific dynamic action. Strang and McClugage,[9] who took great pains to establish a true base line at the beginning of their tests, were unable to demonstrate any depression of the specific dynamic action in the obese. Furthermore, the small specific dynamic action which has been reported by some, if real and not the result of

misleading computations with observed data, could account for no more than a 3% reduction in the total daily metabolism.[10] This, if present, would contribute somewhat to the acquisition of obesity, but is wholly inadequate to account for the facts in most cases.

Water metabolism.—Water balance studies have often been found to explain the discrepancy between the decreased food intake and the failure to lose weight. Some obese persons, when placed on an extremely low-caloric diet, frequently fail to lose weight during the first few days of rigid dieting. It has, however, been observed that after several days these patients will lose weight very rapidly, and at the end of a certain period their weight loss will be such as expected from energy balance calculations. Water balance studies by Newburgh and his collaborators[7, 11, 12] show that this initial failure to lose weight is due to excessive retention of water caused by the low-caloric intake. This has been found not to be particularly specific for obese subjects, since undernutrition will cause the same phenomenon in the normal. After several days diuresis takes place and the subject shows the loss of weight expected from his low-caloric intake. Cycles of periods of water retention and diuresis may become more conspicuous as the period of dieting continues. The extent and duration of these swings varies widely. However, over a long period the up and down swings of water exchange will balance and the scales will show the true weight loss due to the removal of fat.

Other cases, on the other hand, will show, shortly after commencing a restricted diet, a loss of weight in excess of that expected.[10] This is probably due to the fact that some have a mild degree of congestive heart failure, even though no œdema can be clinically demonstrated, and that the institution of the restricted diet is followed by a prompt establishment of cardiac compensation and the loss of unrecognized œdema. A similar early excessive loss of weight occurs when the myxœdematous patient is placed on thyroid therapy.

ENDOCRINE OBESITY

This designation is frequently observed in case reports and in medical literature. Obesity of endocrine origin is a very common diagnosis and is particularly applied to those obese cases who fail to lose weight satisfactorily, thus reserving the description for a sort of mysterious type of obesity. Strang and Evans,[5] while studying the O_2 exchange of obese patients undergoing reduction by limited diet alone, found no difference in response between so-called "endocrine obesity" patients and those who overate. Freyberg and Newburgh[13] in a study of energy exchange of a verified case of pituitary basophilism observed no variation from that known for other obese cases. By controlled diet the expected, calculated loss of weight was almost the same as the actual loss. The term "endocrine obesity" therefore does not designate any particular class of obese persons with a specific energy metabolism. It is useful only in describing the location and distribution of excess fat.

Thyroid.—It is very common to see a case diagnosed as obesity due to hypothyroidism because the B.M.R. is between –10 and –25%. Newburgh[7] criticizes this on two grounds: (1) The alleged normal B.M.R. is too high. People who undergo several B.M.R. estimations and are completely relaxed will show lower B.M.R. values than the so-called normal. (2) When hypometabolism is not associated with the clinical features of myxœdema the subject is not hypothyroid.

Finally a low basal metabolism need not cause obesity. This was shown by the experiments of MacKay and Sherrill[14] on rats. The thyroid was removed from a group of rats 170 days old and a similar group used as a control. Both groups were placed on the same diet; 310 days later the controls had gained 193 gm. whereas the thyroidectomized animals gained only 178 gm. Furthermore, the bodies of the controls contained 31.1% fat whereas those of the thyroidectomized rats contained only 6.4% fat. Since the weights of the latter animals were quite close to those of their controls it was assumed that œdema fluid accounted for part of the weight increase in the thyroidectomized animals.

Plummer[15] studied 200 patients suffering from various grades of myxœdema: 61.5% were overweight. In 8.5% the weight was more than 50 lb. above normal, but in 5.5% it was more than 30 lb. below normal. However, those whose B.M.R.'s were lowest weighed least, and those whose rates were not less than 28% weighed 11.5% too much, whereas those whose rates were less than –28% weighed 14.7% too little. The average excess weight for the whole group was 10.1 lb. During the first days of thyroid medication there was an abrupt loss of weight that averaged 13 lb. This was brought about by diuresis since most were œdematous prior to treatment. Now the group weight had become 2.9 lb. less than normal. The excessive weight in hypothyroid patients so commonly attributed to fat is more properly interpreted as evidence of the accumulation of fluid.

Pituitary.—The clinical diagnosis of "pituitary obesity" is very commonly made, although there is no such entity. Ever since the description of Fröhlich's syndrome in 1901 it has been popularly believed that a pituitary tumour or the destruction of pituitary tissue by the tumour gives rise to obesity. This gained favour when Cushing[16] supported this claim and reported that partial extirpation of the pituitary in dogs gives rise to obesity. This claim, however, has been proved to be incorrect,

for, as will soon be seen, in such cases the obesity is due not to removal of pituitary tissue but to the simultaneous injury of the hypothalamus. In the true Fröhlich's syndrome, too, obesity is apparently due to injury of the hypothalamus.

Furthermore, it has been an unfortunate practice to refer to every case of obesity and hypogenitalism in children as Fröhlich's syndrome, or pituitary obesity, even though a pituitary tumour is never found. Actually, except for the obesity, these are perfectly normal children who grow up to be perfectly normal adults. Such boys are usually erroneously referred to as hypogenital as the penis appears small only because it is embedded in a considerable amount of supra-pubic fat; when one retracts the supra-pubic tissue the penis appears normal in size.

On the other hand, destruction of the pituitary results not in obesity but, on the contrary, in cachexia. The picture of Simmond's disease with the marked emaciation is well known and this condition is the result of destruction of anterior pituitary tissue.

In Cushing's syndrome there is a plethoric obesity confined chiefly to the head and trunk. This is in many cases due to a basophilic adenoma of the pituitary. In many there is no pituitary tumour. In some there is a tumour of the adrenal cortex. Actually there is no marked obesity in the true Cushing's syndrome, and the appearance of a large chest and abdomen is deceptive and is mainly the result of a narrowing or collapsing of the vertebræ and a relaxation of the abdominal muscles.[17, 18]

Hypothalamus.—Philip Smith[19] was the first to demonstrate that in rats careful removal of the pituitary does not cause obesity, whereas injury to the hypothalamus does result in such. He explained that in the dog hypophysectomy does give rise to obesity because of the unavoidable injury to the hypothalamus during the operation. Hetherington and Ranson[20, 21] have recently shown in the rat that firstly simple hypophysectomy does not produce obesity, and secondly that even denervation of the pituitary by cutting the nervous pathways to it, or section of the pituitary stalk, is without effect on the production of obesity as long as no hypothalamic injury is involved. On the other hand, large symmetrically placed lesions of the hypothalamus produce obesity in all the rats. They deduce that the presence of the pituitary is not essential to the appearance of hypothalamic obesity, and that the response seems to be caused by the severance of the pathways which descend from the hypothalamus. Recent work on dogs by Heinbecker and White[22] and by Heinbecker, White and Rolf[23] demonstrated that hypothalamic obesity is due to bilateral injury of the posterior hypothalamus which causes retrograde degeneration of the cells of the paraventricular nuclei. The cell loss of most significance in causing obesity is from the caudal portion of these nuclei and must be bilateral. The maximum degree of obesity results when the entire paraventricular nucleus disappears; partial loss results in only moderate obesity. These workers also claim that obesity develops more rapidly when the supraoptico-hypophyseal system innervating the pitressin-forming tissue of the pituitary is totally or nearly totally inactivated, that is, when total or near total diabetes insipidus exists.

C. N. H. Long and his associates[24, 25] studied the metabolism in hypothalamic obesity. They placed bilateral, symmetrical lesions in the hypothalamus of rats. Almost immediately after the operation these animals began to eat voraciously, often two to three times as much food as eaten by their littermates, and soon became very obese. Ten rats with operation were pair-fed with their controls; they frequently ate their day's ration in less than two hours but did not gain any more weight than their controls. The oxygen consumption in the surgical animals was found to be normal. The authors therefore regard the development of obesity in these animals as a consequence of increased appetite and not the result of any fundamental metabolic disturbance.

TREATMENT

Diets.—Limitation of diet is still the principal way to obtain an effective reduction of weight. All diets devised to reduce weight are founded upon an attempt to compel the body to utilize its own fat for supplying part of the energy it requires. The average normal person requires daily an amount of energy equivalent to about 2,500 calories of heat. This energy is normally supplied by the food we eat. Therefore, if we reduce the total caloric intake below the energy requirements, the fat stored in the body will be called upon to make up the deficiency. The body fat becomes transformed into a utilizable form which supplies energy during muscular work. Hence, the body weight is gradually reduced. The essential feature of a reducing diet is therefore a restriction of its total number of calories.

Studies by Block[26] in Newburgh's laboratory indicate that obese persons release fat from fat stores as a source of energy as readily as normal people. This is in direct contradiction of Hetenyi's theory of "lipophilia", whereby he postulates that in the obese person the fat from fatty tissue is not as easily available as a source of energy as in the normal. In fact, Block's studies suggest that it is likely that the obese release the fat from fatty tissue more readily than the normal, since they usually lose less nitrogen than the normal when they are underfed. Furthermore, in the obese the respiratory quotient, both in the fasting state and after a meal, is lower than in controls, that is, they metabolize more fat.

Diets of widely different caloric values have been recommended by various authorities. In very fat persons Folin and Denis[27] instituted a series of fasts of about five days each with interim diets of insufficient caloric value. They were guided in the length of each fast by the ammonia and the acetone eliminated in the urine. They found this method effective, rapid, and safe. However, such a procedure is impractical and its safety is questionable. Newburgh,[7] as well as Evans,[10] use small diets consisting of about 400 to 600 calories daily, and claim very successful results. The fear that patients on such small diets will not maintain nitrogen balance has been dispelled by the work of Strang and McClugage,[9] who showed that when obese persons subsisted on 450 calories daily they were always in nitrogen balance when the diet contained 60 gm. of protein. However, such diets are probably also impractical for ambulatory patients, though they may be very good for hospitalized cases, especially those who require a rapid reduction of weight, such as obese persons in cardiac failure. For the average ambulatory obese patient who is pursuing his usual occupation the most practical diets appear to be those containing 1,000 to 1,200 calories daily. He will be less uncomfortable, and he will not rebel as readily as against the more restricted diet.

It is of the utmost importance that in causing a loss of weight one should avoid causing also a loss of body protein. It has been found that the inclusion in the diet of 1 gm. protein per kgm. body weight will keep the patient in nitrogen equilibrium. By accomplishing this one will avoid a lowering of the body resistance, a feeling of fatigue and exhaustion, and a lowering of the blood pressure. Even a higher protein intake may be desirable, as 1½ gm. per kgm. body weight. Protein requires 1 to 2 hours of gastric digestion and therefore slows the emptying time of the stomach. In this way, an increased protein intake may eliminate or reduce the sharp hunger pains which frequently occur 1 to 2 hours after meals in patients on a restricted diet. Furthermore, in such cases the sensations of hunger and fatigue are often due to a mild hypoglycæmia and a high protein intake tends to prevent this lowering of the blood sugar. Thorn and his associates[28] have recently shown that in normal people an increase in protein intake decreases fatigue in the late morning and afternoon by preventing the drop in blood sugar that tends to occur at these periods. The same principle is also applied in the treatment of hyperinsulinism with a high protein diet. Protein also has the highest specific dynamic action, and it is claimed that in such a way a high-protein intake will enhance loss of weight. Campbell[29] reports very favourable results with diets of a caloric value of about 20% below basal requirements and containing 2 gm. protein per kgm. body weight. Finally it should be remembered that it is necessary to make up the protein allowance from foods of high biological value.

The remainder of the calories are made up from carbohydrate and fat. The carbohydrate of the food is converted to body fat, and therefore, strictly speaking, it should make little difference whether the carbohydrate or fat element of the diet is more greatly diminished. Some authors allow a liberal amount of fat though most claim that the carbohydrate foods are more satisfying. Furthermore, most patients stand a limitation of fat better than that of carbohydrate. It should also be remembered that a minimal supply of carbohydrate equal to 2/3 to 3/4 gm. for each gram of protein is necessary to maintain the patient in nitrogen equilibrium despite an intake of 1 gm. protein per kgm. of ideal weight.

One must also supply the essential minerals and vitamins. Skimmed milk, in addition to being a good source of protein, provides calcium and phosphorus. Fruits and green vegetables are good bulk as well as a good source of vitamins B and C. However, the low fat diet is probably deficient in vitamins A and D. In general, it is a good practice to administer one or two multivitamin tablets daily.

Exercise.—Exercise does increase the energy output, but at the same time it stimulates the appetite. Therefore, if one does not restrict the dietary intake simultaneously, the additional food eaten will cancel the increased expenditure of energy and there will not occur any caloric deficit to result in a loss of body fat. Furthermore, one can more easily attain a certain caloric restriction through limitation of diet than a similar energy loss through exercise. Newburgh[7] has calculated that a man weighing 250 lb. can climb a flight of stairs 10 feet high at the expense of but 3 calories; but by depriving himself of 1/3 gm. butter or 1/4 teaspoon sugar he will reduce his intake 3 calories. He will have to climb 20 flights of stairs to rid himself of the energy contained in one slice of bread. If he is a good walker he may dissipate 100 calories per mile; omission of 1 oz. cream will reduce the intake by the same caloric value.

Wilder and co-workers[30] report two cases who lost more weight on a restricted diet while resting in bed than when up and around. They feel that these patients were close to circulatory failure, and that rest caused the loss of non-pitting œdema.

Physiotherapy. — This does not remove any fat. Through massage and other passive exercise the masseur will lose energy and weight, but not the patient. It will only tone up his flabby muscles. Sweating procedures reduce weight by the removal of water only; furthermore, this weight will be regained in 2 or 3

days as a result of increased thirst causing increased fluid intake.

Thyroid.—From previous considerations regarding energy metabolism in obesity and the small number of obese people who manifest a low B.M.R. it would appear that thyroid should not be administered to the majority of obese patients. However, what is not realized is that many patients who initially have a normal B.M.R. will, after some time on a reduced caloric intake, develop a lower and lower B.M.R. Undernutrition will reduce basal metabolism;[31] this holds good to a large degree for obese persons as well as normal, though to a greater extent in the latter. As a result of mass observations on the effect of lowered rations during the first World War, Benedict and his associates[32] carried out experiments with a group of normal, young individuals whose body weights were lowered as a result of a reduction in their diets. In a group of 12 subjects the daily caloric intake was reduced to 1,400 calories for a period of 3 weeks, during which time there was an average weight loss of only 6.5%. Most of the subjects noted a sensation of cold and a marked reduction in perspiration. The average basal pulse was reduced from 56 to 40 per minute with several instances of pulse rates of 29 to 35 per minute. There was a 25% reduction in basal metabolism during the three-week period. These observations have been confirmed by many, and indeed Master and his associates[33] have taken advantage of these principles to treat cases of coronary thrombosis by a low-caloric diet in order to produce a low B.M.R. In guinea-pigs Stephens[34] even noted that a low-caloric diet, causing a loss of from 20 to 30% of body weight in a period of two weeks, resulted in marked anatomic changes in the thyroid: there was atrophy and flattening of the acinar epithelium and retention of colloid, suggesting a resting, inactive gland.

A similar, though less marked, lowering of the basal metabolism can be observed in obese persons who have been on a reduced caloric intake for several weeks. In such cases further reduction of weight on a restricted diet alone may be very slow, while the addition of thyroid medication will accelerate the weight loss. This will be of great value in the therapy of many obese cases who have already been on a reducing diet for some time.

Furthermore, during the administration of thyroid medication to such cases, as well as to persons of normal weight with a somewhat low B.M.R., certain principles must be observed. In general, an endocrine gland may be set at rest and even caused to undergo atrophy by the administration of the hormone secreted by that gland.[35] In 1920 Leo Loeb[36] showed that the feeding of thyroid tablets to guinea-pigs had a marked inhibitory effect on the compensatory hypertrophy of remnants of thyroid tissue left after partial thyroidectomy. Recently Farquharson and Squires[37] showed that when thyroid is administered to a non-myxœdematous patient, that is, one with some intact thyroid tissue, the B.M.R., after the initial rise, begins to drop in a few weeks and eventually reaches a level lower than the original; but when the thyroid dosage is increased the B.M.R. rises again. Therefore, in administering thyroid over a prolonged period of time the dosage has to be increased from time to time. This is particularly applicable in the treatment of obesity, for here the B.M.R. is disposed to drop still more after the patient is on a prolonged low-caloric diet. Hence thyroid has a place in the treatment of the obese person who initially has a normal B.M.R. if applied on the basis of these physiological principles.

Dinitrophenol.—Only a few years ago this drug was received very enthusiastically by the medical profession for the treatment of obesity. But many cases of toxic reactions and even a few fatalities have occurred. The result is that most clinics have abandoned the drug entirely.

Benzedrine.—Recently some[38] have used this drug in reduction therapy on the principle that it diminishes the person's appetite. However, the dosage required for this purpose is quite high and many undesirable reactions are likely to occur.

Diuretics.—It should first be stated that although many still recommend restriction of water in the treatment of obesity, most authorities feel that this should not be done and that the patient may take as much water as he pleases provided, of course, that he does not take too much sodium chloride. In addition to restriction of fluids some use diuretics. These will definitely cause diuresis and a reduction of weight. However, this weight loss is usually very temporary and will be regained in 2 to 4 days as a result of increased fluid intake. This applies particularly to powerful diuretics, as the mercurials. The diuresis may also result in an excessive loss of sodium and chloride and the patient may feel quite weak and tired and complain of dizziness, and perhaps even of muscle pain. Milder diuretics, such as ammonium chloride, given in smaller doses and over a prolonged period of time may produce a satisfactory loss of weight without any undesirable symptoms.

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CLINICAL and LABORATORY NOTES

A MEDICAL GRADING CODE

By John S. Willis, M.D. and Harold Kalant, M.D.

Toronto, Ont.

In several years of army use, the PULHEMS code system for grading recruits and following soldiers medically was found so valuable for giving a concise overall impression of a man's fitness for duty, that it seemed likely that a similar system would prove worth while in civilian practice and especially in grading men and women for industry. It was felt, however, that for civilian purposes, the code letters PULHEMS were insufficient to give a complete medical picture of the average civilian, especially if disabled by illness.

After considerable thought, bearing in mind the need for a word easily pronounced and spelled, and with letters whose interpretation could easily be remembered, the code word PACKINGHOUSELTD (pronounced "packing-house limited") was chosen, the literal meaning having, of course, no significance. This word contains all the letters of the original PULHEMS system, in their original meanings, except the letter "M" for mental level, which was combined with the letter "N" for neurological system, in this new word. Naturally, since a good many of the younger doctors are familiar with the PULHEMS system through their experience on active service, this fact will make the new word all the more easily understood.

The individual letters of this code are interpreted as follows:

P — (Physique), the individual's general physique, constitutional condition, his state as a physical, mental, and emotional unit.
A — (Arterial), the heart and circulatory system.
C — (Chest), the whole respiratory system.
K — (Kidney), the urinary and genital tracts.
I — (Intestine), the gastro-intestinal tract.
N — (Neurological), the neurological system, including the mental level, but not emotional stability.
G — (Glands), all glands, both those of internal and external secretion, including the gonads.
H — (Hearing), the ears and hearing.
O — (Blood), the lymphatic and hæmopoietic systems.
U — (Upper), upper limbs and upper back.
S — (Stability), emotional stability.
E — (Eyes), eyes and vision.
L — (Lower), lower limbs and lower back.
T — (Teeth).
D — (Dermatology), the skin, hair, and nails.

It is suggested that five grades be assigned to each letter on the basis of function. These could be set arbitrarily as follows:

Grade 1. Obviously fit for any and all activities; eyesight and hearing perfect, emotional stability normal, etc.

Grade 2. Fit for most activities, with slight limitations.

Grade 3. Fit for sedentary occupations only, or those permitting definite defects in vision, hearing, emotional stability, etc.

Grade 4. Only capable of very light work, permitting serious defects in vision, hearing, etc.

Grade 5. Incapable of any work at all.

Using this system, workers could be medically graded for industry in the same way that the army classified men for various forms of army activity. Thus a man in good health with imperfect eyesight, partially corrected by glasses, would be graded thus,

YOB	PACKINGHOUSELTD
1917	1 1 1 1 1 1 1 1 1 1 1 3 1 1 1

YOB would refer to the year of his birth, and E-3 to eyes and vision, grade 3. An employer, seeing this rating on the man's certificate, would know that he could be employed on any type of job not requiring first-class eyesight.

Probably the system could be used by the individual doctor too, as a means of summing up briefly the condition of each patient, and as a means of following patients from year to year. Correspondence on this subject will be welcomed by the authors.

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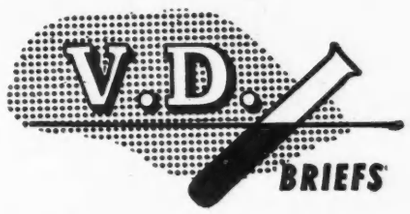
VENEREAL DISEASE CAMPAIGN



Moral and Social Controls Needed in Anti-V.D. Fight

It is an axiom in public health that to prevent the spread of communicable disease the contact of infected with non-infected persons must be prevented. This is true in the case of tuberculosis, of diphtheria and of smallpox.

"It is also true of Venereal Disease in spite of the fact that some highly trained medical leaders would have us believe that Venereal Disease is in a completely different category because sex is involved", writes Dr. Gordon Bates in an article "Sex education is not enough" in a recent issue of the magazine *Health*, official publication of the Health League of Canada.

Dr. Bates intimated it was evident in this connection that some public health authorities considered that questions of morals were none of their business.

"These quasi experts fail to observe in their pronouncements that no normal woman with a decent education wants to be a prostitute or to be promiscuous", writes Dr. Bates. "It is equally true that no young man who has a proper conception of the history of advancing civilization and its connection with romantic love wants to be promiscuous if a normal marriage is possible for him at a normal age—or indeed, wants to be promiscuous at all. In Anglo-Saxon countries the great Victorian authors and poets, Thackeray, Scott, Dickens, Browning, Wordsworth and Tennyson, have taught him this lesson.

"Such lessons are not learned by observing test tube reactions or peering through a microscope—but they must be learned before the scourge of Venereal Disease can be controlled. In the long run it is possible that Robert Browning and Sidney and Beatrice Webb will play as great or a greater part in the control of Venereal Disease than Ehrlich and Wassermann.

"It has been unfashionable to discuss Venereal Disease in terms of morality, yet without morality in the true sense affecting both conduct and social conditions, Venereal Disease cannot be controlled."

Dr. Bates thinks any thoughtful person must recognize the fact that the Venereal Diseases arise from abnormal relationship outside of marriage and that these arise from factors influencing conduct.

"Yet it is obvious that many people who ought to know better have taken the view that mere education as to the facts of Venereal Disease and the provisions of facilities for diagnosis and treatment are sufficient to control Venereal Disease."

Dr. Bates reviews reports which indicate that in North America Venereal Diseases are on the increase—"in the face of a widespread educational campaign as to the facts of Venereal Disease and the most rapid improvement in methods of treatment in the history of the world."

V.D. Statistics

Over a thousand more cases of venereal disease were reported in Canada in the second quarter of this year than in the same period in 1945, according to a statement by the Hon. Dr. J. J. McCann, acting minister of National Health and Welfare.

"Although the most recent reports show a decline in new cases, venereal diseases continue among the top-ranking problems facing Canada today", Dr. McCann said. "Venereal disease can be eradicated. This year the federal government has set aside over $270,000 to combat the V.D. menace, but legislation, money and medical skill are not enough. To eliminate this scourge requires an enlightened community and wholehearted co-operation, not only on the health front but equally on the moral, welfare and legal sectors."

In the first six months of this year 21,933 cases of syphilis and gonorrhœa were reported. Of these 8,283 were syphilis and the remainder gonorrhœa.

The total number of cases in the April-June quarter was 10,235 as against 11,698 in the first three months of the year. For the April-June period of 1945 the total of new cases of all types of V.D. was 9,188.

The rate of syphilis for Canada has fallen from 147 per 100,000 population during the first quarter of 1946 to 125 per 100,000 in the April-June period. The rate of gonorrhœa per 100,000 has declined 11%, from 236.8 to 210.8 per 100,000 population.

"Find V.D. Contacts — Report V.D. Cases"

THE CANADIAN MEDICAL ASSOCIATION

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EDITORIAL

WHAT IS THE REAL INCIDENCE OF POLIOMYELITIS?

BEGINNING in July, and running on into the autumn, the incidence of poliomyelitis in many parts of eastern Canada has reached epidemic proportions. The numbers of reported cases are noted in the daily press and followed with anxious interest by worried parents. Do these figures represent the actual incidence of the disease, or are many cases overlooked and unrecorded?

The diagnosis of poliomyelitis presents peculiar difficulties. Specific virus tests are so complicated and expensive that few laboratories are equipped to undertake them, and consequently they can seldom be applied. Recognition must be based on the history, the clinical findings, and the course. Not uncommonly it rests on a balance of probabilities rather than on scientific certainty. Encephalitis of various types and other infections of the central nervous system sometimes give similar signs, and can only with difficulty be excluded. An acute illness in a child or young adult, with moderate fever, some resistance of the neck to forward flexion, more or less stiffness of the back, and a positive Kernig sign in one or both legs, is strongly suggestive. If demonstrable paralysis shortly follows, and/or an increase of cells and proteins in the spinal fluid can be found, there is little room for doubt. Statistics grounded on these criteria are accurate as far as they go, but do the available statistics include all the cases?

What of the many febrile disorders of varying severity which seem to be so rife during an epidemic? They have few distinctive signs, essentially negative laboratory findings, and promptly recover without obvious sequelæ. That many of them are mild or abortive cases of poliomyelitis is commonly accepted. Others are minor infections of different etiology, such as influenza, upper respiratory conditions, gastrointestinal disturbances. It is impossible in practice to differentiate with any degree of accuracy this confusing group. If all are considered to be poliomyelitis, the resulting figures would be too high. If all doubtful cases are excluded, as is now the tendency, the numbers reported are almost certainly much too low. The apparent mortality rate of about 4.5% is consequently too high, and the same criticism applies to the figures sometimes given for those likely to suffer from permanent disabilities.

The incidence of definitely diagnosed cases in an outbreak rarely goes as high as 1 in 2,000 of the population at risk, and is often considerably lower. Even if most of the concurrent minor infections are included, the total is not strikingly large. Several possible explanations for this relatively low attack rate may be advanced. Poliomyelitis is perhaps naturally not very communicable, or certain uncommon factors may be necessary for its transmission, or most people may have an adequate degree of tissue immunity, inborn or acquired. There is evidence, based on limited surveys, that a very high percentage of city people have specific antibodies in their blood. According to accepted theories this, as in other virus diseases, is most likely due to previous attack or exposure. The incidence of poliomyelitis is therefore probably considerably higher than statistics would indicate, but it has not been possible to even estimate the number of cases that really occur. Careful observation of large but relatively controllable groups during an epidemic might yield approximations of some value.

As the undiagnosed cases probably roughly parallel those with recognizable signs, reported figures give a fairly accurate measure of the prevalence of poliomyelitis in a community, rather than its actual incidence. By what factor they should be multiplied to give the true total is a problem still unsolved.

R.C.S.

EDITORIAL COMMENTS

Immunization with B.C.G.

The search for a direct remedy in the treatment of tuberculosis continues. No specific has yet been discovered, neither antibiotic nor chemical, although streptomycin has roused expectation. Protective or immunizing methods are also constantly being tried. Of these the Calmette-Guérin bacillus vaccine has been the longest in the field and probably has had the widest trial. B.C.G. was used first in France more than 20 years ago, and was first administered by mouth to infants. Later, subcutaneous injection was employed. The production of tuberculin sensitiveness by vaccine is definitely proved, but it is not so easy to show how much protection against tuberculosis is produced by this type of vaccination, nor how long it lasts. From the very beginning statisticians have questioned the accuracy or weight of conclusions made from its use in various groups. The observed difference in mortality were not always great enough to be more than fortuitous; the vaccinated children were not a random sample representative of the same population as those taken as controls; such factors as medical or home care, frequency of inspection, etc., were extremely difficult to assess. One epidemiologist felt that the use or neglect of this method of treatment would depend on psychological considerations.

The opposition therefore to the use of B.C.G. seems to have been largely of the passive kind. It does not seem to have brought enough conviction of its value to cause its universal adoption. It has been given its most extended trials in Europe, particularly Central Europe and Norway, and it is in the latter country perhaps that the most extensive and carefully controlled observations on its use have been made. In Canada, perhaps the largest group of children to be vaccinated with B.C.G. has been in Montreal under the direction of Dr. Baudouin, with indications of the reduction of tuberculosis in the third, fourth and fifth years of life. On the other hand the conclusion reached in New York City in a recent series was that as a public health measure B.C.G. is less advantageous than the removal from the home of children of the tuberculous subject.

We believe that there is now a movement to introduce it in Great Britain, and consideration is being given to the production in that country of the necessary supply of vaccine. The precautions to be used in the manufacture of the vaccine are so stringent that centralization of its production under proper control would seem to be a necessity, for it is recognized that considerable variations in the virulence of the vaccine occur, enough to seriously impair its value on the one hand, or to cause local effects which if not serious may be a grave difficulty in the extensive use of the vaccine.

This method of vaccination has been shown to be free of danger, but apparently it will require several years of carefully controlled observation before it can be regarded as an indispensable part of the anti-tuberculosis program.

MEN and BOOKS

TREPANATION AMONG THE EARLY INDIANS OF BRITISH COLUMBIA*

By G. E. Kidd, M.D.

Vancouver

Trepanning and trephining are not altogether synonymous terms. The former is derived from a Greek word meaning an auger, and refers to the making of a surgical opening in a living skull by any instrument whatsoever. Trephining refers to the more recent method of opening a skull by the removal of a disk of bone by a crown saw.

Trepanning of skulls during the neolithic age was fairly widespread among the peoples of the world. It is generally assumed that it was introduced into America from Siberia. This theory has been substantiated by the finding of a trepanned skull on Kodiak Island off the coast of Alaska. On this continent, during pre-Columbian times, and possibly later, it was most commonly practised in Peru and Bolivia, where trepanned skulls have been found in great numbers. A few have been discovered in Mexico, but to the north of that country it is rare. The late Dr. Hrdlicka, of the Smithsonian Institute, in a review published in 1939 could cite only half a dozen cases from the United States. These came from widely scattered points, Georgia, Michigan and New Mexico. The same report refers to three specimens of trepanning as having been found in Canada; all on the Pacific Coast. Of these, two came from Boundary Bay, south of Vancouver, and were described by the late Harlan Smith of the National Museum at Ottawa. The third was found in 1930 at the mouth of the Fraser River. It is skull No. 1 among the specimens exhibited here today. More recently skulls Nos. 2 and 3 have been found, both in British Columbia. So far as I know, no other cases of aboriginal trepanning have been found in Canada.

While all three skulls antedate the coming of the white man, No. 1 is the only specimen the age of which can be estimated with any degree of accuracy. It was found by excava-

* Read at the Seventy-seventh Annual Meeting of the Canadian Medical Association, Section of Historical Medicine, Banff, Alberta, June 12, 1946.

tors working for the Vancouver City Museum, in the great Eburne shell mound at the mouth of the Fraser River. On the surface of the mound a 450 year old tree had grown, while the lower layers of shells from which the midden was built must have been placed there at a very much earlier date.

The skull is that of a young adult male, probably in his early twenties. It is unique in having been what is known as a copper burial, a ceremony reserved for persons of high rank. The forehead and chest were covered by thinly beaten out sheats of native copper.

In the centre of the occipital region there is a circular opening some 24 mm. in diameter, which shows evidence of cicatrization and must have been made during life. The opening is saucer-shaped, the outer table of the skull having been denuded over an area double the size of the fenestrum in the inner table.

Fig. 1

A second smaller cup-shaped excavation is to be seen about two inches to the right of the first, and over the lower end of the parieto-occipital suture line. It is 18 mm. in its longest diameter. In depth it barely reaches through the inner table of the skull. Here there is no evidence of healing. The diploe are open and the edges of the wound are sharply defined, while scratches made by a cutting instrument are still to be seen on the walls. The operator either ran into difficulties, or his patient died while he was still at work.

Skull No. 2 is the property of Dr. Robertson Jr. of Vancouver. It was recently discovered on the West Coast of Vancouver Island in the mining district of Zabellos. It was thrown up by a bulldozer making excavations. The conditions under which it was found are not known so that the approximate age of the specimen can in no way be determined. It is an oblong skull of a middle-aged male. In this case also the opening is located in the region of the external occipital protuberance, and is in every way similar to the larger opening in skull No. 1, except that it is larger, being 42 mm. in its longest diameter. The operative area shows evidence of healing, so that the patient must have lived for some time subsequent to his trepanation.

Skull No. 3 is that of an elderly person and was found recently in one of the numerous shell heaps of the Boundary Bay area. It was dug up about twenty yards from high tide. It is not a case of true trepanation, but rather that of a denudation of the outer table over a wide area. The depression is oval shaped and is 50 mm. in its longest diameter. What therapeutic effect was hoped for by this operation is not known. Hrdlicka describes a similar case of a Peruvian skull where the outer table was extensively removed from the frontal area, with no disturbance of the inner table. It is possible that our specimen may have been an interrupted attempt at complete trepanation. The location of the operative area is identical with openings in the other two skulls, the upper mid-occipital area. It shows evidence of healing.

It will be noted that all three specimens have several things in common. (1) The openings, except for the smaller one in skull No. 1, are located in the same area, the upper central occipital. (2) In each case the same technique was used in performing the operation, and similar instruments were used. (3) In each case—again excepting skull No. 1—the patient survived long enough for healing to take place.

These facts may indicate, either that all three operations were performed by the same person; or that all operators followed the same technique, and that the teaching of the art of trepanation along the Coast was uniform.

The sites of operation in these specimens are not such as would be chosen by a neuro-surgeon of today. They are dangerously close to the large blood sinuses in this area, but the operator must have proceeded with great skill and care when cutting through the inner table leaving the dura intact.

The reasons for trepanation in these cases can only be guessed at. A long-time missionary among the Coast Indians of B.C., told me of being approached by a chief, carrying a brace and bit, who begged him to bore a hole in his skull to allow the escape of an evil spirit which was causing him to have headaches. Hrdlicka assumed that it was done to relieve such conditions as epilepsy, convulsions, insanity, and headache, all of which were attributed to

demons enclosed within the cranium. Many Peruvian trepannings however, were done to relieve pressure resulting from depressed fractures caused by war clubs. These last were true surgical procedures. Even our own cases may be regarded as surgical procedures in that the operation was done to permit the escape from the body of some malign influence which was supposedly causing distressing symptoms. The Indian was probably sincere in his reasons for trepanning a skull, although such reasoning was limited by his knowledge of pathological conditions.

The method of operation and the nature of the instrument used varied. In cases of depressed fracture the Peruvians used a flint saw by means of which a rectangular window was cut in the skull wall and the fragments of bone removed. In other cases a circular trench was made by a flint chisel and the circumscribed disk pried out. In each of the cases shown here, the method of making the opening was by scraping, the instrument used being a sharp spoon-shaped piece of flint. From the pericranium to the dura the bone was carefully scraped away a little at a time. This was a tedious but eminently safe procedure.

It would seem almost impossible that a human being could have borne the prolonged pain and shock of an operation such as this. It is quite probable, however, that these native surgeons had a knowledge of certain plant juices which would produce a local anæsthesia. This was the case farther south where the leaves of the coca plant from which cocaine is made are known to have been used for that purpose.

These primitive surgeons also knew how to dress a wound. I think you will agree with me that in none of the specimens shown here is there the slightest evidence that inflammation or suppuration following the operation. There is no heaping up or erosion of bone. The early Indians almost certainly had a knowledge of antiseptics in some form, and successfully used them to promote healing without infection.

Fig. 2

Fig. 3

ARTHRITIS AMONG THE EARLY INDIANS OF BRITISH COLUMBIA

Arthritis is one of the earliest and most wide spread diseases from which mankind has suffered, and the early Indians who lived on the damp slopes of the North Pacific Coast had their share of it. A very high percentage of the skeletal remains taken from the various shell mounds of British Columbia shows evidence of the disease. It is prevalent in the various joints of the extremities, but the vertebral column seems to have been the most common site of attack. I have the skull of an aged individual taken from an elaborate cairn-like grave in the Harrison Lake area, some 75 miles inland from the coast. Attached to it are the first five cervical vertebræ, which are solidly fused each with the others, and with the base of the skull. Pathologists have diagnosed the condition as resulting from rheumatoid arthritis.

The taking of steam baths in bark tents was a common practice among the Indians when the white man first came, the steam being generated by throwing water on hot stones. Authorities suggest that this was a therapeutic measure for the treatment of arthritis.

ARTIFICIAL DEFORMATION OF THE SKULL AMONG THE INDIANS OF BRITISH COLUMBIA

We have several specimens showing intentional deformation of the skull by artificial means. Four of them are wedge-shaped, a result of pressure applied directly from front to back. The other is what is known as a sugar loaf skull, in which the deformity is produced by a tight bandage being placed about the occiput, which causes an elongation of the posterior part of the skull.

Artificial deformation of the skull was a common practice among certain tribes of the Pacific North West, down to recent times. About the middle of the last century an Eastern Canadian artist, Paul Kane, visited the Coast and has left us both drawings and detailed written accounts of the technique of deformation, which was in common usage at the time. In the case of the wedge-shaped skulls the infant was, immediatly after birth, placed on its cradle board, and the head was firmly fixed by a strap of woven cedar bark which passed across the forehead. The area of counter pressure on the occiput was well padded. Pressure was continued for eight months, after which time the deformation was permanent. Only for a few days after the pressure was first applied would the child cry; later it seemed to get used to it. Again when the head band was finally removed there would be acute discomfort for a time.

A deformed skull, amongst the Indians, was a badge of good family and pure blood. No slave was allowed to deform the head of his child. Persons who have known these individuals during life assure us that there was no lessening of the intelligence as a result of this artificial deformation.

925 W. Georgia St.

ASSOCIATION NOTES

We reproduce herewith as a pleasant reminder a group photograph of the Canadian Association of Radiologists taken at the meeting at Banff in June. We are enabled to do this by the kindness of the Canadian Industries Limited.

In this group photograph, taken at Banff Springs Hotel, are:

Back row (*left to right*): Mrs. Guillaume Gill, Montreal; Dr. D. G. Florendine, Calgary; Mrs. S. M. Rose, Lethbridge; Dr. J. J. Porter and Mrs. Porter, Calgary; Dr. R. C. Burr and Mrs. Burr, Kingston; Dr. C. M. Henry and Mrs. Henry, Victoria; Dr. A. E. Blacket and Mrs. Blacket, New Glasgow, N.S.; Dr. Ethlyn Trapp, Dr. H. H. Cheney, Dr. Margaret Hardie, and Mrs. H. H. Cheney, all of Vancouver; Mrs. J. Lloyd Brown and Mrs. Allin Blair of Regina; Mrs. W. H. McGuffin, Calgary; Mrs. W. A. Whitelaw, Mrs. B. J. Harrison and Mrs. Bruce McEwen, all of Vancouver; Mr. E. Dale Trout, Chicago; Dr. A. E. Childe, Winnipeg; Dr. N. E. Dunn, Edmonton, and Dr. W. A. Whitelaw, Vancouver.

Front row (*left to right*): Dr. E. W. Spencer, Saskatoon; Dr. Ivan Smith and Mrs. Smith, London; Dr. S. M. Rose, Lethbridge; Dr. Guillaume Gill, Montreal; Dr. W. H. McGuffin, Calgary; Dr. Jules Gosselin, Quebec City; Mr. Percy Ghent, Toronto; Mr. Bert Merrin, Winnipeg; Mrs. E. W. Spencer, Saskatoon; (name not ascertained); Dr. C. W. Prowd, Vancouver; Dr. R. Proctor, Edmonton and Dr. Christina A. Fraser, Vancouver.

MEDICAL SOCIETIES

Prince Edward Island Medical Society

At Summerside on the evening of August 23, a most enjoyable dinner and educational program was held in Epworth Hall.

The Medical Educational Committee under the chairmanship of Dr. J. C. Houston is to be congratulated for their splendid activities during the past year.

Monthly dinners have been in order at which the doctors, their wives and friends, have gathered not only to do justice to the sumptuous repasts provided, but also to make new acquaintances and renew old friendships. It provides a splendid opportunity for the newer members of the Society to become acquainted with the older members.

The educational program was interesting and well presented. Participating were Dr. Claude Holland, Halifax, who spoke on the "Diagnosis, complications and treatment of diabetes"; and Dr. Cyril Kenley, Halifax, who for some years has been in charge of the Polio Clinic, in Halifax, and a strong advocate of the Kenny method of treatment. Dr. Kenley gave a most timely and forceful talk on "Infantile paralysis", illustrating the signs and pathology in a case recently recovered from the acute phase of the disease. He gave in detail the method of treatment which he had found most beneficial during the years he had supervised the clinic.

Visitors present included Dr. Ray Brow, Dr. Fred MacKay of Montreal, Dr. H. A. Ansley of Ottawa, and Dr. Pearl Hopgood of Dartmouth, N.S.

Canadian Tuberculosis Association

The 46th annual meeting of the Canadian Tuberculosis Association was held in Calgary at the Palliser Hotel on September 9, 10 and 11. About forty members from eastern and western Canada were in attendance. At the annual dinner meeting, Dr. A. H. Baker, Superintendent of the Central Alberta Sanatorium, was installed as president, succeeding Dr. J. D. Adamson, of Winnipeg, in this office. Dr. G. J. Wherrett, of Ottawa, was re-elected executive secretary.

Following executive meetings and the meeting of the advisory committee on Indian tuberculosis during the first day, the program absorbed most of the second and third days. There was a general session on Tuberculosis Control in Canada under the ægis of the Department of National Health and Welfare, the Department of Veterans' Affairs and the Canadian Pension Commission. Of seven resolutions adopted by this Association, four had to do with prevention of the tuberculosis scourge. Recommendations are to be forwarded to the proper federal departments, that chest x-rays are to be taken of well discharged exservicemen; (2) all European war brides; (3) every patient admitted to hospital; and (4) all immigrants either prior to leaving or before arriving at a Canadian port. Another resolution asked that this Association "urge that adequate grants for the prevention and control of tuberculosis be made available by the Federal Government to the various provinces, and so enable all provinces to develop fully effective tuberculosis programs. The need of such Federal assistance is urgent."

A feature of the program was on mass surveys which included B.C.G. vaccination by Dr. R. G. Ferguson; rehabilitation by Dr. T. A. J. Cummings and records and statistics by Dr. G. J. Wherrett.

On the last day of the meeting, the members were the guests of Dr. A. H. Baker at the Central Alberta Sanatorium and two clinical sessions were held. Drs. E. L. Ross and J. Orr discussed a "Study of minimal lesions"; Dr. A. C. Sinclair "Selective thoracoplasty" and Dr. A. R. Armstrong, "New laboratory procedures".

Dr. A. H. Baker's subject was "Alberta's tuberculosis program". Dr. R. G. Huckell discussed "Tuberculosis of the spine", and Dr. G. H. Hames "Tuberculosis of the trachea and major bronchi".

During the afternoon the members and their wives enjoyed a garden party at the Sanatorium, which was under the direction of Miss Kathleen Connors, Superintendent of Nurses and her staff.

La Société de Chirurgie de Montréal

Séance de la Société de Chirurgie de Montréal le 4 septembre 1946.

1. OSTÉOMYÉLITE AIGUE, VS SULFAMIDÉS ET PENICILLINE. —J.-C. Favreau.

Jusqu'à l'avènement des sulfamidés, l'ostéomyélite était considérée comme une maladie grave dans ses conséquences locales et générales. La mortalité atteignait 30%. Le traitement de cette maladie était varié. Le chirurgien drainait les abcès, trépanait, curettait, réséquait, appliquait des larves, de la vaseline, etc. Médicalement, on a employé le sérum de convalescents, les immuno-transfusions, les vaccins, les bactériophages, le propidon, le carbone intraveineux, l'aurothérapie, le mercurochrome intraveineux, etc.

Les sulfamidés sont venus et ont marqué le point de départ d'une ère nouvelle avec un changement important dans le traitement et les conséquences de cette terrible affection. La mortalité est devenue presque nulle, les jours d'hospitalisation ont considérablement diminué, la guérison locale a été obtenue en un temps relativement très court.

A son tour la pénicilline est venue et l'on a vu nos statistiques s'améliorer encore de façon insoupçonnée.

A l'appui de ces affirmations, trois tableaux comparatifs ont été préparés. Le tableau no. 1 résume les observations de 10 cas d'ostéomyélite traités à l'Hôpital Sainte-Justine avant l'ère des sulfamidés: la mortalité a été de 20%; la moyenne des jours d'hospitalisation a été de 254; la moyenne du temps de guérison a été de 26 mois. Le tableau no. 2 résume les observations de 10 cas d'ostéomyélite traités avec l'aide des sulfamidés: la mortalité a été nulle; la moyenne du temps de guérison a été de 7.7 mois. Le tableau no. 3 résume les observations de 10 cas d'ostéomyélite traités avec l'aide des sulfamidés et de la pénicilline: la mortalité a été nulle; la moyenne des jours d'hospitalisation a été de 33 jours; la moyenne du temps de guérison a été de 3 mois.

Ce travail a été préparé dans le but de répondre de façon précise à cette question que nous posent souvent les médecins qui n'ont pas l'habitude de traiter un grand nombre de cas d'ostéomyélite aigue. Notre rôle d'orthopédiste dans le grand hôpital pour les enfants malades nous a permis de présenter cet exposé bien insuffisant.

2. RUPTURES SPONTANÉES DE L'UTÉRUS.—Lucien Julien.

La gravité des ruptures spontanées de l'utérus dont la symptomatologie peut varier à l'extrême, fait le début de ce travail. Cette affection est relativement fréquente puisqu'elle peut aller de 1 pour 95 à 1 pour 6,000, et grave parce que responsable 40 à 60% de mortalité chez la femme qui en est atteinte.

La rupture est plus fréquente chez les multipares et surtout chez celles qui ont déjà eu des césariennes, ou quelque intervention que ce soit sur l'utérus. Le rapporteur cependant présente un cas de rupture utérine chez une primipare à terme, âgée de 33 ans, où les symptômes de choc et d'hémorragie interne étaient réduits au minimum, et qui n'avait eu pour toute intervention sur l'utérus qu'un curettage un an auparavant. Guérison après hystérectomie sub-totale. Il décrit les ruptures complètes et incomplètes, et le mécanisme du placenta prævia fréquent dans ces cas parce que décollé de la paroi de l'utérus.

Le choc, l'hémorragie ou l'infection sont ordinairement la cause de la mort chez ces patientes.

Difficile à confondre avec une autre complication, la rupture spontanée peut cependant passer inaperçue, mais une fois le diagnostic fait, le traitement en est la laparatomie pour suture de la déchirure ou hystérectomie sub-totale selon les cas. Le pronostic sérieux de cette affection exige donc un diagnostic précoce et une intervention urgente dans le plus grand intérêt de la mère et de l'enfant.

3. TRAITEMENT DU COXA-VARA.—A. Samson.

L'auteur présente six cas de coxa-vara qu'il traite par une ostéotomie sous-trochantérienne. Les fragments ont été maintenus en position de correction à l'aide de plusieurs clous de Steiman. Dans deux cas, il a fallu faire un allongement des muscles péroniers.

ANTONIO SAMSON, M.D.
Secrétaire

UNIVERSITY NOTES

Registration of medical students in Canada as reported so far for this year is as follows:

University of Alberta: in all years, 179. First year 45; second year 37; third year 44; fourth year 32; fifth year 21 (graduating October 5, 1946).

Dalhousie University: in all years, 219. First year 59; second year 52; third year 44; fourth year 36; fifth year 28.

McGill University: in all years, 462. First year 116; including 72 ex-service.

Queen's University: in all years, 257. First year 61; second year 56; third year 51; fourth year 48; sixth year 41.

University of Toronto: in all years, 912. First premedical year 138 ex-service and 58 civilian; first year medicine 143 ex-service and 21 civilian.

CANADIAN MEDICAL WAR SERVICES

MEDICAL OFFICERS STRUCK OFF STRENGTH OF THE R.C.A.M.C.—ACTIVE FORCE

AUGUST, 1946

(Previous sections in January, March, April, May, June, July, September, October, November, and December, 1945 and January, March, May, June, July, August, September and October, 1946)

SECTION LXXXII

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Allen, M.,	1265 Hart St., Three Rivers	31-5-46
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Atkinson, H. S.,	Box 1190, Portage La Prairie, Man.	27-6-46
Austin, W. E.,	Hazelton, B.C.	16-7-46
Babineau, G.,	La Tuque, Que.	18-6-46
Balfour, G. S.,	3027-4th St., S.W., Calgary	24-6-46
Barber, G. S.,	35 Charlotte St., Brantford, Ont.	25-7-46
Barends, H. A.,	168 Bayswater Ave., Ottawa	11-7-46
Barnett, H. J. M.,	62 Brooklyn Ave., Toronto	10-7-46
Basmajian, J. V.,	41 Lappin Ave., Toronto	24-7-46
Battista, A. F.,	9 Whitehead Ave., Cornwall, Ont.	25-6-46
Bean, J. L. M.,	H.M.C.S. Cornwallis, Halifax, N.S.	9-7-46
Bearisto, A. W.,	15 Oriole Parkway, Toronto	24-5-46
Beaudin, A. D.,	St. George de Beauce, Que.	9-7-46
Beaudoin, L. P.,	44 St. Genevieve St., Que.	4-7-46
Beaule, A.,	359 Arago St., Que.	20-6-46
Belanger, R.,	Kedgwick, N.B.	8-7-46
Bell, D. M.,	13417-102nd Ave., Edmonton	29-5-46
Bellamy, R. P.,	Lumsden, Sask.	19-6-46
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Brown, E. M.,	111 Albert Ave., Saskatoon	28-6-46
Buell, A. L.,	223 West 13th Ave., Vancouver	5-7-46
Butcher, J. J.,	53 Fairleigh Ave. S., Hamilton, Ont.	10-7-46
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Campbell, D. B.,	23 Algonquin Ave., Toronto	29-5-46
Campbell, D. E. M.,	Trenton, Ont.	8-7-46
Cappe, B. E.,	114 Beatrice St., Toronto	23-7-46
Carson, J. H.,	Mountain Sanatorium, Hamilton, Ont.	9-7-46
Cave, H. A.,	Winthrop Chemical Co., Dominion Square Bldg., Montreal	12-7-46
Cham, M.,	151 Alfred Ave., Winnipeg	12-7-46
Champagne, J.,	1422 Notre Dame St. W., Montreal	24-7-46
Charman, J. H.,	52 Walnut St., Halifax	21-5-46
Chartier, J.,	26 Bourdages St., St. Hyacinthe, Que.	17-7-46
Chepesuik, M. W.,	313 Collingwood St., Kingston, Ont.	5-7-46
Cholod, S.,	Hafford, Sask.	12-7-46
Clarke, W. T. W.,	409 Walmer Road, Toronto	22-7-46
Claveau, R.,	29 Begin Ave., Chicoutimi, Que.	14-6-46
Cluff, J. W.,	625 West 12th Ave., Vancouver	4-7-46
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Corrican, V. A.,	290 Johnson St., Kingston, Ont.	8-7-46
Cosgrove, J. B. R.,	Tilston, Man.	28-6-46
Cowley, F. C.,	220 Powell Ave., Ottawa	9-7-46
Croome, R. R. M.,	124 Church St., Sault Ste. Marie, Ont.	27-6-46
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Davis, M. M.,	Box 186, Truro, N.S.	13-6-46
Debly, J. P.,	125 Jubilee Rd., Halifax	19-7-46
D'Eon, B.,	50 St. Louis St., Quebec	6-7-46
de St. Victor, J.,	940 St. Valier St., Quebec	13-7-46
Doidge, W. A.,	412 Brunswick Ave., Toronto	9-7-46
Dolan, R. J.,	South Nelson, N.B.	17-6-46
Dubeau, J. A. M.,	Hospital St. Justine, Montreal	9-7-46
Dunn, D. H.,	R.R. 5, Cookstown, Ont.	17-7-46
Dunn, N. E.,	Vermilion, Alberta	10-6-46
Dunsworth, F. A.,	168 Barrington St., Halifax	10-7-46
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Dupre, G. H.,	26 Hebert St., Quebec	3-7-46

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Firstbrook, J. B.	2 Doncliffe Place, Toronto	2-7-46
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Fortier, J.	L'Enfant Jesus Hospital, Quebec	12-7-46
Foxgord, R. N.	Marigold P.O., Victoria	3-7-46
Fraser, K. A.	Whycocomagh, Inverness County, N.S.	6-6-46
Fraser, M. M.	Walters Falls, Ont.	11-7-46
Gauthier, P.	12 Laporte St., Quebec	11-7-46
Geleff, T.	45 Nasmith Ave., Toronto	24-7-46
Gemmell, J. P.	Assinibois, Sask.	20-6-46
Gendron, J. B.	Weyburn, Sask.	29-6-46
Germain, R.	466 St. Simon St., St. Hyacinthe, Que.	27-6-46
Giroux, M. L. Y.	14 Green St., St. Lambert, Que.	22-7-46
Golding, T. A. S.	1603 Maple Ave., Pullman, Washington, U.S.A.	23-7-46
Goldstein, A. V.	181 Markham St., Toronto	3-7-46
Gordon, C. A.	Campbellton, N.B.	8-6-46
Gorvoy, J. D.	173 Beatrice St., Toronto	9-7-46
Goudreau, R.	83 St. Georges St., Levis, Que.	13-5-46
Graham, W. L.	918 Centre St., Whitby, Ont.	28-6-46
Grant, D. K.	Suite 10, Willingdon Apts., Winnipeg	22-6-46
Gray, A. G.	120 Oak St., Winnipeg	2-7-46
Green, N.	32 George St., Peterborough, Ont.	28-6-46
Grieve, J. D.	Address not known	10-7-46
Grignon, G. E.	St. Jovite, Que.	12-7-46
Grise, E. A.	c/o Mrs. D. Nolan, Brantford, Ont.	5-7-46
Hahn, C. E.	36 Strath Ave., Toronto	5-7-46
Halfhide, R.	1385 Bernard Ave., Apt. 20, Montreal	8-7-46
Hardie, P. W.	Mountain Sanatorium, Hamilton, Ont.	18-7-46
Hazen, F. C.	Newcastle, N.B.	4-7-46
Hawks, G. H.	168 Lytton Blvd., Toronto	5-7-46
Hay, A. J. S.	General delivery, Stettler, Alta.	11-6-46
Hebert, J. G.	4203 Rue Ste. Catherine, East, Montreal	15-7-46
Heller, E. M.	154 Chiltern Hill Rd., Toronto	9-7-46
Hellman, K.	Paradise Hill, Sask.	19-6-46
Henderson, M. H.	203 Lauder Ave., Toronto	3-7-46
Heninger, M. K.	Raymond, Alta.	11-7-46
Heron, J. S.	22 York Ave., Mount Dennis, Ont.	15-7-46
Herscovitch, O.	4202 Van Horne Ave., Montreal	19-7-46
Holden, C. P.	176 St. John St., Fredericton, N.B.	16-7-46
Holmes, R. B.	1015 Wellington St., London, Ont.	9-7-46
Hotz, H.	105 Cannon St. E., Hamilton, Ont.	8-7-46
Hunt, D. W.	336 Maplewood Ave., Winnipeg	5-7-46
Jacques, M.	12 Laporte St., Quebec	25-6-46
James, M. M.	209 University Ave., Kingston, Ont.	2-7-46
Janowsky, S.	776 St. Patricks St., Victoria	8-7-46
Jenkins, G. E.	Ontario Hospital, New Toronto, Ont.	28-6-46
Johnston, M. W.	Eston, Sask.	10-7-46
Junek, V. D.	Esterhazy, Sask.	11-7-46
Karlinsky, W.	423 Dufferin Ave., Winnipeg	15-7-46
Keevil, R. F.	Toronto Hospital for Consumptives, Weston, Ont.	17-7-46
King, D. M.	1855 West 43rd Ave., Vancouver	10-7-46
Kinley, G. J.	92 Oxford St., Halifax	21-6-46
Kobernick, S. D.	1428 Mansfield St., Montreal	18-7-46
Kucherepa, J. W.	268 High Park Ave., Toronto	24-7-46
Lamb, E. R.	118 Broad St. West, Dunnville, Ont.	4-7-46
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Lander, H. A.	438 St. John's Ave., Winnipeg	26-6-46
Langis, L. R.	20 Peel St., Sherbrooke, Que.	11-7-46
Lapierre, A. P.	524 Windermere Ave., Toronto	5-7-46
Lavallee, L.	180 St. John St., Quebec	11-7-46
Laverone, P. H.	5365 Decelles St., Montreal	3-7-46
Lavers, H. D.	Parrsboro, N.S.	8-6-46
Lavoie, R.	514 St. Cyrille St., Quebec	10-7-46
Learoyd, D. R.	2993 West 44th St., Vancouver	4-6-46
Leclerc, G.	121 Chapel St., Ottawa	16-7-46
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Lewis, G. A.	238 Glenview Ave., Toronto	5-7-46
Littner, N.	Toronto	4-7-46
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McCormick, R. W.	Harrow, Ont.	9-7-46
MacDonald, A. R. S.	Coaldale, Alta.	10-6-46
MacDonald, F. B.	341 King Edward St., Glace Bay, N.S.	5-6-46
McFadden, R. L.	1782 Assiniboine Ave., Winnipeg	26-6-46
McIntosh, J. D.	302 South Syndicate Ave., Fort William, Ont.	10-7-46
McKenzie, A. D.	Kelowna, B.C.	2-7-46
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MacKinnon, K. J. C.	Antigonish, N.S.	11-7-46
MacIntosh, C. N.	62 Hawthorne St., Dartmouth, N.S.	5-7-46
MacLean, A. D.	67 Middlegate St., Winnipeg	17-6-46
McMullen, D. G.	R.R. 5, Trenton, Ont.	8-7-46
McQuaig, K. D.	Finch, Ont.	18-7-46
MacTavish, J. E.	Suite 6, Royal York Apts., Winnipeg	15-7-46
Maloney, J. H.	Barachois, Gaspe County, Que.	22-7-46
Mann, I. W.	146 South Mitton St., Sarnia, Ont.	30-7-46
Marchand, P.	St. Trite, Champlain County, Que.	14-6-46
Marshall, N.	Taber, Alta.	2-7-46
Mercado, A. L.	St. Justine Hospital, Montreal	12-7-46
Merritt, J. O.	8 Nelles Blvd., Grimsby, Ont.	9-7-46
Miller, D.	718 Granville St., Vancouver	21-6-46
Miskelly, L. M.	Rosetown, Sask.	3-7-46
Moir, J. B.	644 Banatyne Ave., Winnipeg	2-5-46
Moore, J. A.	Smooth Rock Falls, Ont.	11-7-46
Morrison, J. K.	St. Peter's, Richmond County, N.S.	29-6-46
Morse, W. I.	Paradise, Annapolis County, N.S.	29-6-46
Mosser, H. A.	Ilderton, Ont.	25-6-46
Murray, G. M.	213 Union St., Sydney, N.S.	13-7-46
Murray, I. M.	Box 140, Stellarton, N.S.	29-6-46
Murray, W. B.	Morley, Alta.	11-6-46
Myers, F. D.	1332 Dundas St. W., Toronto	16-7-46
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Newell, J. E.	Box 513, Portage La Prairie, Man.	24-6-46
Nicholson, G. M.	827 King St. E., Hamilton, Ont.	25-7-46
O'Donnell, W. J.	Bathurst, N.B.	28-6-46
Orr, W. J.	2128 Culp St., Niagara Falls, Ont.	4-7-46
Ostrander, A. B.	1037 Dorchester Ave., Winnipeg	10-6-46
Oxorn, H.	4380 Harvard Ave., Montreal	2-7-46
Palanek, F. G.	390 Princess Ave., London, Ont.	30-6-46
Paradis, B.	50 St. Louis St., Quebec City	11-7-46
Parker, G. N.	31 Playter Crescent, Toronto	28-6-46
Parrott, F. C.	Midland, Ont.	3-7-46

Name	*Address*	*Date struck off strength*
Pearman, R. W.,	1471 Chomedy St., Apt. 5, Montreal	2-7-46
Pelletier, G. J. L.,	34 Blandford St., Toronto	4-7-46
Perry, A. W.,	2507 Avebury St., Victoria	19-7-46
Pierce, M. K.,	354 Stella Ave., Winnipeg	17-7-46
Pitcher, H. V.,	153 Pinnacle Ave., Belleville, Ont.	13-7-46
Pratt, M. C.,	c/o Mrs. W. A. Irish, 755 Willington Crescent, Winnipeg	3-7-46
Prueter, G. W.,	122 Allen St. West, Waterloo, Ont.	12-7-46
Raymond, G. H.,	5681 Terrebonne St., N.D.G., Montreal	24-6-46
Rigg, L. I.,	Dunnville, Ont.	5-7-46
Robertson, C. M.,	Nelson, B.C.	13-5-46
Robitaille, J. C.,	51½ Rue St. Anselme, Que.	5-7-46
Rochon, M. J. G.,	677 Fleury St., Montreal	22-7-46
Rock, E. D.,	100 Wellington St., Kingston, Ont.	28-5-46
Ross, W. D.,	3655 St. Famille St., Montreal	16-7-46
Rotenburg, C.,	334 Rushton Road, Toronto	4-7-46
Roulston, T. J.,	2113 Smith St., Regina	12-7-46
Rousseau, J.,	123 Grande Allee, Quebec	6-7-46
Ruddick, R. B.,	1491 Crescent St., Montreal	10-7-46
Rublee, J. D.,	Wilkie, Sask.	29-6-46
Russell, W. F.,	Coombs, B.C.	5-7-46
Sabourin, G. A.,	St. Jean Baptiste, Man.	18-7-46
Schwartz, B.,	Ashern, Man.	5-7-46
Scott, C. I.,	Orangeville, Ont.	27-6-46
Scott, G. O.,	211 Melrose St., Ottawa	30-5-46
Sereda, M. M.,	1125-91st Ave., Edmonton	18-6-46
Seymour, B. A.,	Haileybury, Ont.	6-7-46
Shapiro, B. J.,	1622 Lajoie St., Outremont, Que.	8-7-46
Sheer, W. T.,	Suite 5, Clayton Apts., Winnipeg	25-7-46
Sherman, A. I.,	28 Cannon St. W., Hamilton, Ont.	3-7-46
Shuman, B.,	Ottawa Civic Hospital, Ottawa	19-6-46
Silverman, S. B.,	5265 Cote St. Luc Road, Montreal	20-6-46
Simard, F. X.,	St. Joseph D'Alma, Lac St. Jean, Que.	4-7-46
Slater, H. M.,	6 Connaught Circle, Toronto	3-7-46
Smith, E. J.,	Shediac, N.B.	26-7-46
Smith, V. W.,	29 Beech Drive, Victoria	5-6-46
Solmes, J. G. R.,	36 Colborne St. E., Oshawa, Ont.	11-7-46
Spencer, S. H.,	430 Palmerston Blvd., Toronto	17-7-46
Sproule, H. F.,	1200 Weston Road, Mount Dennis, Ont.	25-7-46
Standish, C. T.,	3183 West 5th Ave., Vancouver	12-7-46
Stanley, R. A.,	Vancouver, B.C.	27-4-46
Stevenson, H. C.,	Belmont, Man.	12-7-46
Strickland, S. C.,	850 East River Road, New Glasgow, N.S.	13-6-46
Surchin, H. H.,	636 Belmont Ave., Westmount, Que.	8-7-46
Sussman, A. H.,	Arthur, Ont.	4-7-46
Tannenbaum, I.,	5303 Esplanade Ave., Montreal	8-7-46
Tardif, G.,	46 Couillard St., Quebec	11-7-46
Taylor, C. L.,	36 Edgewood Crescent, Toronto	11-7-46
Teleford, D.,	2956 Point Grey Rd., Vancouver	27-6-46
Tessier, P. E.,	La Perade, Champlain County, Que.	29-6-46
Tremblay, A.,	20 Bagot St., Bagotville, Que.	2-7-46
Trichman, B.,	211 Beverley St., Toronto	4-7-46
Therrien, R.,	39 Genevieve Ave., Quebec	8-7-46
Tremblay, B. M.,	Lachute Mills, Que.	18-7-46
Turner, A. S.,	8619-108A, Edmonton	18-6-46
Tyhurst, J. S.,	799 Linkless Ave., Victoria	19-6-46
Walker, W. R.,	Penticton, B.C.	31-5-46
Watson, E. E. B.,	Apt. 1, 1 Benlamond Ave., Toronto	28-6-46
Weaver, K. S.,	3701 Dewdney Ave., Regina	10-7-46
Weinberg, F.,	175 Grace St., Toronto	4-7-46
Weinlos, C. W. H.,	11219-100th Ave., Edmonton	18-6-46
Whish, L. E.,	139 Albany Ave., Toronto	18-6-46
Wiggin, N. J. B.,	123 King Street East, Kingston, Ont.	10-7-46
Williams, C. F.,	324 Somerset St. W., Ottawa	24-7-46
Wilson, J. C. S.,	Port Colborne, Ont.	11-7-46
Wilson, W. W.,	McNamee, N.B.	20-6-46
Winter, B.,	47 Barton Ave., Toronto	2-7-46
Wolfe, A. D.,	108 Havard Ave., Winnipeg	15-6-46
Wolff, R. G.,	General Delivery, Cardston, Alta.	20-7-46
Wong, W. A.,	518 Waterloo St., London, Ont.	11-7-46
Wyatt, E. R. S.,	4391 Harvard Ave., N.D.G., Montreal	19-7-46
Zad, V. M.,	225 Prince Edward St., Saint John, N.B.	12-7-46

SECTION LXXXIII

Died in Canada	*Date of death*
Groff, H. K., 11131-88th Ave., Edmonton	24-8-46

CORRESPONDENCE

Irresistible Impulse and Crime

To the Editor:

I have read with great interest the article and letters in your *Journal* by W. C. J. Meredith, K.C., M.A., and Dr. G. H. Stevenson, dealing with the question of "Irresistible impulse and crime". Mr. Meredith's article in the April issue appeared to me to be rather contradictory. In the first part he seemed to rather favour the admission of the "irresistible impulse" as a legal excuse for crime, whereas in the latter part he quoted apparently with approval Judge Riddell of Ontario and Chief Justice Gibson of Pennsylvania as opposing this suggestion. In his letter in June, Mr. Meredith was of the opinion that only by admitting the validity of the "irresistible impulse" could any improvement be made in the present status of mental illness as an excuse for crime in Canada.

May I be permitted to point out that the State of Massachusetts has been able to approach this whole question in a more scientific manner. The operation of the Briggs Law in Massachusetts is fully described by Prof. F. E. Haynes, Professor of Sociology, State University of Iowa in his textbook on "Criminology". The Briggs Law was as follows:

"Whenever a person is indicted by a grand jury for a capital offense, or whenever a person, who is known to have been indicted for any other offense more than once, or to have been previously convicted of a felony, is indicted by a grand jury or bound over for trial in a superior court, notice shall be given to the Department of Mental Diseases and the department shall cause such person to be examined with a view to determine his mental condition and the existence of any mental disease or defect which would affect his criminal responsibility. The department is required to file its report with the clerk of the court in which the trial is to be held and the report is to be accessible to the court, the district attorney and to the attorney for the accused and is admissible as evidence of the mental condition of the accused".

The examination is made before trial and before it is decided whether or not to resort to the defense of insanity. During the years 1921 to 1933, 3,610 persons were examined and 610 cases or 16.9% of all cases examined were bound to have some evidences of mental

deviation, leaving 83.1% who were mentally normal. There is no limitation upon the right to introduce other mental experts but since the law has been in operation, the practice has become almost non-existent. Since the costs of jury sessions of courts are estimated to be $500.00 a day, not including the fees of experts, it has saved the expense of many costly trials. Since the Briggs Law was passed there has been an average of less than one case a year in which alienists have been employed by the defense in trials. The National Crime Commission in June, 1928 stated:

"Obviously, what steps to take depend upon the kind of individual the court is dealing with. The psychiatrist with his special knowledge of certain types of human behaviour, comes in to assist the court in gaining an understanding of the prisoner, of his intellectual condition, his emotional make-up, character and personality traits, educational and social back-ground and other important mental and physical factors bearing upon the case. It is the criminal and not the crime that must be dealt with."

I have personal knowledge of case 2 mentioned by Dr. Stephenson in his clear and comprehensive letter. This Indian is a low grade mental defective—a fact that should have been easily evident at the time of his trial—and is now under constant observation in our psychiatric ward. If this man is discharged from the penitentiary, he wil be transferred to a mental hospital for further care. Several other cases at present under psychiatric observation were undoubtedly psychotic when sentenced and if Canada had had a Briggs Law would have been transferred to a hospital for the criminal insane instead of being sent to a penitentiary where their care is a very serious problem to the disciplinary authorities.

Mr. Meredith appears to be of the opinion that "the right to trial by jury is a fundamental principle of our constitution and to substitute a board of experts for the jury . . . . would establish a dangerous precedent". Like Dr. Stevenson, I have frequently observed the "deliberations" of juries on the question of insanity and I have yet to see one jury which had the capacity or the intelligence to adjudicate such a difficult question.

C. M. CRAWFORD, M.D.

Psychiatrist's Office,
Kingston Penitentiary,
Kingston, Ont.

Latin in Prescription Writing

To the Editor:

The usage of Latin in prescription writing is with medical nomenclature the very last, and shabby, remnant of a bygone time in which science was truly international. It is the remnant of a time when the universities were truly *Universitates Literarum,* based on the mediæval conception of the Latin schools in which the *artes liberales* were taught; the philosophical background being humanism and the conception that European culture was a continuation and evolution of the Roman Empire and Christian universality. This conception seems to have given way to thoroughly materialistic thinking emancipated from tradition. Our universities have become highly specialized, overspecialized, training schools for artisans; the teaching of the humanities has been largely abandoned in our secondary schools, and is being scoffed at as just so much unnecessary ballast.

We just as well may face the facts, and throw Latin out in prescription writing; it is illogical and insincere to bother our students with Latin abbreviations and terms, as they are entirely lacking the prerequisites to understand those Latin words. Under the present circumstances to use Latin in prescription writing reeks of charlatanism and shamanism; it serves only to impress the patient with a number of letters unintelligible to him and only learned by rote by the doctor. ("Doctor" comes from *Homo doctus* "the well learned man").

The use of the imperial system is a crime against exact science. It is shameful that the Anglo Saxon world is clinging to such a thoroughly outmoded and primæval system. Every conceivable effort should be made to eradicate such an utter nuisance. If our young graduates will be taught to use the metric system only, and if this will also be enforced in all teaching hospital we may perhaps in the next twenty years be able to get rid of this archaism.

A. F. PERL

SPECIAL CORRESPONDENCE

The London Letter

(From our own correspondent)

THE PUBLIC HEALTH DURING THE WAR

The report of Sir Wilson Jameson, as Chief Medical Officer of the Ministry of Health, "On the State of the Public Health during Six Years of War", is a striking tribute to the skill with which the health services were organized and managed during the years of war. In spite of air-raid casualties amounting to 60,854 killed and 86,159 seriously wounded in England and Wales, mass evacuations, threatened food supplies, overtime in factories and the physical and mental strain of black-out conditions, the health of the nation emerged better in 1945 than it was in 1939.

The infant mortality rate (under one year), always considered a reliable criterion of the public health, reached a new low record in 1944 of 45 deaths in every thousand live-births. This improvement was not confined to the first year of life but was shown at all ages up to 14 years. Influenza once or twice assumed a threatening aspect, but only the 1943 outbreak was at all severe. Cerebro-spinal meningitis was more frequent than during the 1914-18 war, but the sulfonamides provided an effective check. Tuberculosis was another problem that at one time assumed serious proportions, partly due to faulty, though possibly unavoidable, administrative measures, but the position eased somewhat during the later years of the war. To the sulfonamides and penicillin must be given the credit for keeping the venereal diseases problem within reasonable limits.

When it is realized that in London alone more than a million people were sometimes spending the night in air-raid shelters, while civilian doctors were reduced to such an extent that the ratio became one doctor to 4,500 people, the medical profession has every reason to be proud of the part it played on the "home front" during the war.

DOCTORS, DENTISTS AND VETERINARY SURGEONS

By a curious coincidence, if coincidence it is, doctors, dentists and veterinary surgeons are all at loggerheads simultaneously with the government over the question of remuneration. Doctors are involved over the question of the capitation fee payable under the National Health Insurance Scheme. When the Spens Committee (previously referred to in this correspondence) was set up the Minister of Health agreed that the findings of the Committee would apply irrespective of the institution of any national health service, and would directly bear upon existing conditions in the present National Health Insurance Scheme. This was taken by the profession to be a promise that the recommendations of the Spens Committee would be applied as soon as the committee reported. The committee recommended a capitation fee of 15s., but the Minister has announced that he will only authorize a rise from 10s. 6d. to 12s. 6d.

Convinced that this is a breach of faith, the Insurance Acts Committee has recommended all doctors concerned to place their resignations from the National Health Insurance Service in the hands of the committee, and to authorize the committee to submit these mass resignations should the Minister prove intransigeant. This is the same procedure as was followed successfully in a similar dispute in 1923.

A similar line of action is being adopted by the dentists as a result of the new scale of fees for dental benefit under the National Health Insurance Act. The Council of the British Dental Association has advised all dentists to refuse all dental benefit letters forthwith, and to tell patients that they will treat them privately at the scale of fees rejected by the Minister of National Insurance.

In the case of the veterinary surgeons, status as well as salary is involved, objection being taken to the new scale of salaries, partly on account of their inadequacy, partly on account of the marked difference between the salaries offered and those paid to the medical profession.

This particular controversy has received sudden publicity from the unusual action of the Minister of Agriculture in declining an invitation to attend the annual dinner of the National Veterinary Medical Association on the grounds that "the deliberate policy adopted by the association to further its aims makes—as it is expressly intended to make—co-operation between the Ministry and the association impossible".

Apart from the merits of the case presented by the three professions, and it is generally agreed that the claims are reasonable, it is unfortunate at this particular time that the government, through three of its Ministers, should give the impression, rightly or wrongly, that professional skill is to be relegated to a position secondary to that of economy.

Streptomycin

Plans have just been announced for the production in this country of streptomycin. As in the case of penicillin, initial production and clinical trials are to be carried out under the supervision of the Ministry of Supply, the Ministry of Health and the Medical Research Council. Four firms are to co-operate in the pilot-plant production and production on this scale is already under way. No streptomycin will be released for general use until full clinical trials have been carried out under the ægis of the Medical Research Council, and in view of the conditions in which streptomycin is said to be of value, such trials will obviously take a considerable time. Meanwhile, however, plans will proceed for large-scale production, so that when clinical trials are complete adequate amounts will be available for general use.

Ice-cream and Enteric Fever

Two recent outbreaks of enteric fever—one of typhoid involving over 180 cases, and one of paratyphoid involving over 70 cases—have been traced to ice-cream vendors who were carriers. That such outbreaks should occur as a result of contaminated ice-cream is anything but surprising. As *The Lancet* has pointed out, it is 67 years since it set up a commission which "drew attention to the appallingly filthy conditions in which ice-cream was made in the Italian quarter of London". Conditions have certainly improved since then, but they are still far from satisfactory, in spite of action by certain progressive local authorities and by the Ice-Cream Association of Great Britain. Indeed, as far back as 1927 this association invited the Minister of Health to prepare a legal definition of ice-cream and to enforce the licensing by local authorities of all makers and vendors. This apparently simple and straightforward invitation, however, was ignored, and the best that can be obtained from government quarters is a statement by the Parliamentary Secretary to the Minister of Food that "we told the ice-cream trade over a year ago we intended setting up a minimum standard as soon as we could obtain sufficient supplies of the proper ingredients. *That time has not yet come*" (the italics are your correspondent's). WILLIAM A. R. THOMSON

London, October, 1946.

The Holland Letter

(*From our special correspondent*)

An Artificial Kidney

The Dutch internist Dr. E. W. J. Kolff of Kampen, has constructed an apparatus, called the artificial kidney. With the help of this apparatus patients, otherwise dying by uræmic or anuric conditions, may be kept alive.

The patient's blood, liquefied by heparine, is dialyzed in the artificial kidney, and urea, creatinine, indoxyl and other toxic products are withdrawn from the blood. The surface of the kidney suitable for the dialyzing, is 24,000 cm.^{2} and the apparatus is filled completely by only 250 cm.^{3} blood. In 14 hours 120 litres of blood passed through the kidney, and 250 grams of urea were washed out of the passing blood.

If the urea is washed out of his blood, it takes about 6 days before the patient will become uræmic. In these 6 days the patient's own kidneys have the possibility of resuming their function.

Up till now cases of chronic and acute uræmia and of anuria have been treated with the artificial kidney, and often the results were favourable, though definite statistics are not yet available.

The work of Dr. W. J. Kolff was honoured by the University of Groningue, with a doctor's degree *honoris causa* for his book on the artificial kidney.

The Rations in Holland During the War

A table, published by Dr. C. den Hartog, head of the Information Department of the Institute for Nutrition, shows, that the quantities of food decreased in Holland, as in other countries of Europe, from the beginning till the end of the war. During the last months of the occupation, there was a real famine in Holland, and the Dutch civilian population had to live on rations consisting of only 10 gm. of fat, 16 gm. of proteins and 112 gm. of carbohydrates daily, offering only 618 calories.

		Calories	*Proteins in %*	*Fats in %*	*Carbohydrates in %*
1941	second quarter	1,806	13.0	22.1	64.9
	third "	1,764	12.3	20.0	67.7
	fourth "	1,761	12.0	18.8	69.2
1942	first "	1,780	12.3	19.8	67.9
	second "	1,658	12.6	19.6	67.8
	third "	1,633	12.5	17.7	69.8
	fourth "	1,748	12.0	16.5	71.5
1943	first "	1,740	11.3	16.6	72.1
	second "	1,702	11.8	12.6	75.6
	third "	1,681	11.4	14.4	74.2
	fourth "	1,694	11.1	14.8	73.8
1944	first "	1,602	11.0	14.5	74.5
	second "	1,544	11.7	12.6	75.7
	third "	1,425	11.8	13.7	74.5
	fourth "	1,021	11.6	17.4	71.0
1945	first "	618	10.6	15.1	74.3
	second "	1,396	12.0	26.0	62.0
	third "	2,036	12.2	24.7	63.1
	fourth "	2,178	11.7	20.9	67.4

During the first months of 1946 the official rations, thanks to importations and increased production in the country itself, reached a total of 2,112 calories, consisting of 49 gm. fats, 61 proteins and 352 carbohydrates. The food contained during this period 26.0 mgm. of vitamin C, 0.98 mgm. B_1 and 0.87 mgm. B_2. There were 230 International Units vitamin A in the food. Vitamin C and vitamin A-D are regularly given to Dutch children.

Expansine the First Dutch Antibioticum

Before the war, van Luyck, a Dutch biologist, made some researches on the influence of *Penicillium expansum* on diseases of plants. Special sorts of *Penicillium expansum* (Link) Thom produced certain antibodies, called mycoines. The extract of *Penicillium expansum* inhibited the growth of Pythium de Baranym *Hesse* in a dilution of 1:1,280.

In the laboratories of the University of Utrecht *Penicillium expansum* was produced in great quantities under supervision of Professor V. J. Koningsberger. At the same time, in Amsterdam, Professor B. C. P. Jansen and his staff of the chemical physiological department of the University of Amsterdam, continued their studies about the chemical problems of the antibiotics produced by *Penicillium expansum*.

All this work has been done during the war under the greatest difficulties. The Germans wanted specimens of the extracts, but only non-working extracts were given to them.

Expansine, as the crystalline form of *Penicillium expansum* were called, was isolated in February, 1944. It was the first Dutch antibiotic. Dr. O. Osterhuis and Dr. Nauta defined the chemical structure as anhydro-3-oxymetyl-4-pyron-carbonacid. Even in a dilution of 1:16,000,000 it had an influence on the growth of *Pythium de Baranyum*.

Expansine appeared to be highly toxic but it was used, applied in ointments, on external bacterial and mycotic diseases, such as eczema, impetigo and ringworm. Expansine inhibits the growth of Gram-positive and Gram-negative bacteria.

It turned out that in England Professor Raistrick had isolated a product called patulin of *Penicillium patulum* (*Brit. M. J.*, p. 915, 1945). Patulin and expansine have the same chemical composition. Researches in Britain on patulin and of expansine in Holland are going on.

Gifts of the American Red Cross

The New York Botanical Gardens made a gift of 20 million units of penicillin to the Dutch Red Cross as an expression of thanks for the tulip bulbs, presented to the New York Botanical Garden by the Dutch Government. The American Red Cross transported the penicillin in the first Dutch airplane "The Flying Dutchman" of the New-York-Amsterdam line.

Complete surgical outfits for 18 Dutch surgeons were received in Holland as a gift of the American Red Cross.

Bovine Tuberculosis During the War

The chief of the Amsterdam laboratories for public health, Professor Charlotte Ruys, made before and during the war researches on the infection by bovine tuberculosis. Before the war children up to 15 years suffering from tuberculosis of the lungs, were in 9% infected by the bovine type of tuberculosis. In other forms of tuberculosis, *e.g.*, of bones, the bovine type was found in 21%. For adults the same figures are respectively 1 and 20%.

Bovine tuberculosis is especially spread by the consumption of milk. Milk was rationed during the war and the general food situation became worse and worse in the years following 1940. It was found that though tuberculosis infection became more frequent during the war than ever before, the human type of tuberculosis was found in the great majority of cases. Bovine tuberculosis, was seldom found, a fact due to the rationing of milk and the pasteurization, perfected in the beginning of the war.

J. Z. Baruch
Amsterdam-Z, Holland

During the war years the birth-rate for England and Wales rose steadily, reaching 17.7 in 1944 (the last complete year to which this report relates), its highest point since 1926. The death-rate has remained steady, and in 1944 was 12.7. The principal certified causes of death were in the same order each year—diseases of the heart a long way first, followed by cancer, intracranial lesions of vascular origin, bronchitis, tuberculosis, and diseases of the digestive system.—*Brit. M. J.*, September 21, p. 432, 1946.

ABSTRACTS FROM CURRENT LITERATURE

Medicine

Health Protection in the Production and Use of Atomic Energy. Bale, M. F.: *Occupational Med.*, **2**: No. 1, July, 1946.

This article is of some interest to the medical profession in general in view of the fact that radioactive elements are now being used clinically in some centres and their therapeutic importance promises to become greater in the near future. The author points out that in the production of energy by nuclear reactions radioactive elements are produced and that the amount of radioactivity is directly proportional to the amount of energy generated. Hitherto these reactions have taken place only under closely supervised conditions, or else with destructive intent as when the atomic bomb was detonated over Hiroshima. At Hiroshima only 5% of the casualties were the result of radiation sickness: however, those near the site of explosion were killed by detonation, and had a slow reaction involving the production of radioactive elements without detonation occurred, it is conceivable that the casualty list might have been as long, due to radiation deaths alone. And of course, when atomic energy is used for peacetime purposes a slow non-explosive reaction will be sought after.

It is not visionary to say that atomic energy has arrived: already much research work is being done with radioactive elements in tracer experiments, and of course the workers involved are exposed to radiation, the effects of which are as yet little known. The author points out the need for careful and fundamental research work on this problem. As radioactivity becomes more important both in medicine and as a source of power, this problem will become increasingly more urgent.

Douglas Findlay

A Study of 219 Cases of Peptic Ulcer in a Series of 2,301 Consecutive Necropsies. Gibbs, J. O.: *Quart. Bull. Northwestern University Med. School*, **20**: 3, 1946.

This article is based on the findings in 2,301 routine post-mortems carried out by the Department of Pathology of Northwestern Medical School between 1921 and 1929; 219 cases of peptic ulcer were found and a statistical analysis of these provides information of much value to the clinician: information which, while not startling, should help to clarify many of the current controversies regarding this disease.

In general, the results tend to confirm the generally accepted views. The rate of incidence of ulcer was 9.55%, the 219 cases comprising 134 cases of gastric ulcer, 100 duodenal lesions, with combined lesions in 17 cases. The age incidence for both types was in the 51 to 60 year group. The author neglects to give the sex incidence. Of interest is the fact that the series comprised 219 cases, of which 186 were pathologically active: of these, 38 or 20.5% were correctly diagnosed. However, 128 cases or 58.5% were clinically symptomless.

The author's findings supports the view that malignant change in peptic ulcer is a relatively rare occurrence. Only 5 cases (2.4%) showed malignant change. Whether these were gastric or duodenal ulcers is not stated. His figures regarding hæmorrhage as a cause of death or a contributing factor show that 35 cases or 16% developed this complication. Perforation occurred in 10.5% of the series.

Douglas Findlay

Acute Pericarditis in Young Adults. Nay, R. M. and Boyer, N. H.: *Am. Heart J.*, **32**: 222, 1946.

This is a study of acute pericarditis in 46 young soldiers. In 25 cases rheumatic fever was considered to be the etiological factor: in 15 no definite etiology was determined and in the remaining 6 cases, various

etiological factors were present. The clinical differentiation between the first two groups rested upon the coincident joint manifestations and leucocytosis in the rheumatic fever cases; and the abrupt severe onset and absence of leucocytosis in the cases of idiopathic origin. There was no appreciable difference between the two groups in the incidence or amount of pericardial effusion, nor in the electrocardiographic findings. Electrocardiographic abnormalities diagnostic or suggestive of pericarditis were found in 43 of 45 cases. In 29 cases tracings were taken until abnormalities were no longer present, the changes conforming to those usually described as occurring in acute pericarditis. Of interest is the fact that normal electrocardiograms were obtained as long as 2 to 3 weeks after the onset of pericarditis before changes occurred; and in 25 of the 29 cases T wave abnormalities did not occur prior to the 5th day. These findings stress the importance of taking frequent tracings.

The differentiation between the idiopathic group and cases of myocardial infarction rested upon the early presence of a pericardial friction rub in the former together with the aggravation of pain on breathing, swallowing and twisting the trunk, the absence of leucocytosis, and the electrocardiographic findings.

A. L. JOHNSON

Effect of Salicylates on Acute Rheumatic Fever. Warren, H. A., Higley, C. S. and Coombs, F. S.: *Am. Heart J.*, **32:** 311, 1946.

This study is based on 186 cases of acute rheumatic fever in young adults observed under three different therapeutic regimens. Eighty-eight patients received small doses of sodium salicylate ranging from 2 to 7 gm. daily: 50 patients received 10 to 16 gm. by mouth: 48 were given 10 gm. intravenously for a week and then received the same dosage by mouth as group ii.

The observations of the three methods of treatment on the sedimentation rate were submitted to statistical analysis and it was found that large doses were no more effective than small doses in reducing the rate. With regard to the control of fever, large doses had a significant effect in reducing the temperature, the large oral doses being more effective than the intravenous therapy. Large dose therapy did not reduce the incidence of polycyclic elevations of the sedimentation rate.

Fourteen patients in the entire group developed evidence of organic heart disease or showed increased damage of pre-existing heart disease. This group was divided into 7 cases receiving large dose therapy and 7 cases receiving small dose therapy. These results are based on a relatively short period of observation. There was no significant effect of varying salicylate dosage on the occurrence of a prolonged P-R interval. As regards pericarditis, although the number of cases is small—4 received large doses and 7 received small doses—the authors were impressed with the more favourable response to large dose therapy in this complication.

A. L. JOHNSON

Maternal Rubella as a Cause of Congenital Defects. Parsons, Sir L. G.: *Brit. Med. Bull.*, **4:** 193, 1946.

The reports from Australian workers regarding the apparent etiological relationship between rubella and congenital defects are reviewed. Gregg (1941 and 1944) of Sydney, Australia, collected 206 examples of the association between maternal rubella and congenital defects. The distribution of defects of 130 of these is listed as follows:

Cases	*Deaf-mutism*	*Congenital heart disease*	*Eye defects*
85	present	....	....
17	present	present	....
5	....	present	....
6	....	....	present
8	....	present	present
8	present	present	present
1	present	....	present

Swan and co-workers (1943 to 1944) concluded as a result of their investigations in South Australia that "when a woman contracts rubella within the first two months of pregnancy it would appear that the chances of her giving birth to a congenitally defective child are in the region of 100% and if she contacts it in the third month about 50%". The defects found were defects of the eye, heart, deaf-mutism and mental retardation. The important periods of development in the organs involved, are in the early period of pregnancy, just at the time when it is stated their mothers contracted rubella. There was often more than one defect and many of the children were under-developed and difficult to feed.

The available evidence is considered to support the view that the Australian epidemic was really rubella. That this possible relationship has so recently become apparent is perhaps due to the widespread severe epidemic attacking large numbers of young adults in a population that had enjoyed a long period of freedom from epidemic rubella. There is as yet little data concerning mothers with rubella during pregnancy who gave birth to normal children.

As regards prevention suggestions have been put forward regarding the use of pooled or adult serum, or gamma globulin, or the gamma globulin fraction of rubella convalescent serum. The practical drawback to any plan of prevention is that "the ill-effects of rubella are produced, if at all, in the early weeks of pregnancy, and the mother may well be exposed to or even develop the disease before she realizes that she is pregnant.

A. L. JOHNSON

Curative Properties of Rare Earths Found in British Columbia Peloid Deposits. *Vancouver Med. Ass. Bull.*, **22:** 230, 1946.

Some years ago a discovery was made on the northern coast line of British Columbia of a large deposit of a mineral clay which on spectroscopic analysis disclosed the presence of "Rare earths". The analysis of this clay is as follows:

Silica	52.52
Alumina	19.40
Ferrous Oxide	4.54
Ferric Oxide	3.75
Titanic Oxide	1.12
Lime	4.33
Magnesia	4.47
Potash	3.80
Soda	1.57
Sulphuric Anhydride	.16
Water, Carbonic Anhydride and Organic Matter	4.36
	100.02

The "Rare earths" are a puzzle to analytical chemists inasmuch as each member of the group is a definite element, but all fifteen of them have to occupy the position of one element in the periodic tables being chemically identical. Considerable research work has been done on the effect of these elements on plant growth and it is stated that "one part of these trace elements to two million parts of lean soil often results in a crop of vegetables, rich in vitamins and minerals where formerly they had poor food value". Suspensions of the clay leave a film on glassware which is difficult to remove. Also it is noted that the clay retains its consistency for months in an open container but the moment it is placed in contact with the skin, all the moisture is rapidly absorbed. The clay is able to diminish the growth of *B. Coli* and *Staph. Aureus* by removing food substances required by the bacteria.

The commercial preparation of this clay is known as Absor-Vite and Ray-Vite and is said to be slightly alkaline and to possess a marked buffering action. Its use in 2 cases of lesser curvature gastric ulcer, demonstrated radiologically, led to rapid healing. In a third

case with x-ray findings of a deformed duodenal cap, symptoms were relieved. In a fourth case with ulcer symptoms but no radiological studies, symptoms were said to be quickly relieved.

This medication applied externally is reported to give marked relief in sprains, varicose ulcers, neuritis, and is said to hasten the formation of epithelium over granulating wounds. H. E. M.

Neurofibromatosis Occurring in Three Consecutive Generations. Harvey, E.: *Arch. Ophth.*, **35:** 700, 1946.

Although neurofibroma is a benign tumour, not metastasizing to other organs, its effects can be most disastrous, as was the case with several members of the family here reported. In one member, an eye had to be removed because of the growth of a tumour in the orbit and encircling the optic nerve. In another, the patient died following an operation for removal of the tumours from the occipital fossæ. The three generations showing the tumour were the grandfather, whose three sibs were normal; the mother, who had two normal sibs, and the child in the third generation who had a normal brother. There was a history of the great-grandmother having numerous tumours over the face, but it is not certain that these were neurofibromata. The usual dominant mode of transmission was followed in this family. MADGE THURLOW MACKLIN

Pedigree of Nystagmus, Myopia and Congenital Eye Defects with Mental Deficiency. McGregor, I. S.: *Ann. Eugenics,* **13:** 135, 1946.

There were a great many associated eye defects in this family besides the congenital nystagmus, comprising microphthalmos, conjunctival defects, corneal opacity, cataract, abnormal pupil, coloboma of the retina and optic nerve, and optic atrophy. Myopia and feeble-minded were also present. There were four generations present in the family; no defects are recorded as having been present in the first. By a second marriage a man had 13 children, 4 of whom died in infancy. A daughter, (3) and 2 sons (8 and 12) had myopia and nystagmus. A son and 2 other daughters (4, 7 and 9) had nystagmus. Two sons (8 and 14) were mentally unsound. In the third generation, there were 19 children, offspring of Nos. 3, 4, 8 and 12. Three died in infancy, 4 had nystagmus, 3 had myopia, 3 had myopia and nystagmus, 3 had multiple eye defects. The fourth generation was composed of 8 children, offspring of two persons with myopia and nystagmus, and one who had nystagmus alone. This fourth generation had one who died in infancy and 4 who had both myopia and nystagmus. The chart does not show any of the normal persons marrying, so that the defective persons were offspring of affected parents. The nystagmus was inherited as a dominant, sometimes associated with myopia and sometimes with other eye defects. No person not having nystagmus produced a child with nystagmus. Thus out of 40 persons, 32 grew up far enough to have their defects, if present, detected. Of these 32, 21 had serious eye defects. MADGE THURLOW MACKLIN

Alkali Treatment of Methyl Alcohol Poisoning. Chew, W. B., Berger, E. H., Brines O. A. and Capron, M. J.: *J. Am. M. Ass.*, **130:** 61, 1946.

This report is based on a series of 31 patients suffering from methyl alcohol poisoning. Five died within three hours of admission, and 26 recovered. It is commonly considered that methyl alcohol has a predilection for the retina and optic nerves. It has also been shown that it may cause acute parenchymatous degeneration of the kidneys, liver, heart and other organs. Methyl alcohol is not fully oxidized in the body but is broken down into formic acid and formaldehyde. Formic acid had been found in abnormal amounts eight days after ingestion of the alcohol. The symptoms of intoxication are usually delayed from nine to thirty-six hours. Suddenly headache nausea and epigastric distress may appear, associated with dimness of vision. Blindness may follow rapidly with an increase in gravity of the condition. Eighteen of the patients had definite ophthalmoscopic findings in the fundus. This was chiefly congestion of the optic disk, and œdema of the disk and the immediate adjacent zone of the retina.

Treatment was directed primarily towards overcoming the acidosis. Alkali was given intravenously in the form of 1/6 molar sodium r-lactate in isotonic solution of three chlorides. The amount given was guided by repeated plasma bicarbonate determinations in conjunction with clinical indications. In addition sodium bicarbonate was given by mouth or by gavage, starting with doses of four gm. every fifteen minutes. The total amount of sodium bicarbonate given during the first 24 hours varied from 12 to 100 gm. Whisky was given in one ounce doses every four hours for a day. This is said to promote the displacement of methyl alcohol from its intracellular attachments, and therefore was considered beneficial in the early treatment. The eyes were protected from the light. Improvement of the eye changes under this treatment were particularly gratifying. The response to treatment was prompt in most cases.

There were five deaths. Four of these men were comatose and critically ill on admission. One was conscious but lapsed into coma very shortly. They were all intensely cyanotic and had pronounced respiratory embarrassment. Response to therapy was nil, and they died within three hours of admission. Examination of the brains showed evidence of cerebral œdema in the form of widening of the perivascular spaces and loosening of the brain substance generally and swelling of glial cells. There was no evidence of hæmorrhage or devastation necrosis.

The good results obtained, as well as the rational of this treatment would justify its recommendation. PRESTON ROBB

Penicillin in the Treatment of Putrid Lung Abscess. Steielman, B. P. and Karee, J.: *Ann. Int. Med.*, **25:** 66, 1946.

The complete recovery of five of their six patients with acute putrid lung abscesses under the combined penicillin and sulfadiazine administration prompts the authors to suggest that this method of treatment deserves serious consideration and further extended trial. This is further emphasized since four of the patients belonged to a group heretofor considered in need of immediate surgical interference, all of whom would probably not have survived the operation.

It is different in the case of the chronic lung abscess. Here the lung and bronchi are converted by the reaction to the putrid infection into a maze of fibrosis, multiple hard-walled abscesses, bronchiectasis, atelectasis, and chronic pneumonitis, so that restitution to the normal cannot be hoped for with medical care or even with extensive surgery. At times nothing short of lobectomy or pneumonectomy will save the life of the patient. Nevertheless the combined penicillin and sulfadiazine treatment in such cases is of inestimable value. It lessens toxicity, prevents further septic and metastatic foci, clears the surrounding pneumonitis, and improves the general condition of the patient so that he can better withstand the extensive operation indicated to bring relief.

It is important to bear in mind the need of continuing this combined penicillin sulfadiazine administration in acute putrid lung abscess, not only until all toxic and local symptoms have disappeared but until the chest film shows no abnormal shadows in the segment of lung involved. In chronic putrid abscess this method of care should be started preparatory to surgical intervention, and continued after operation until all toxic symptoms disappear. S. R. TOWNSEND

Surgery

Cineplastic Forearm Amputations and Prosthesis. Rank, B. K. and Henderson, G. D.: *Surg., Gyn. & Obst.*, **83**: 373, 1946.

The reasons for attempting to provide a forearm prosthesis, the types which have been supplied, and their relative value, are described. A concise review of cineplasty, which is an attempt to provide a prosthesis motivated by the muscles in the amputation stump, is followed by a description of its requirements: the plastic operation involved; and the prosthesis. Both are described in detail.

It is emphasized that success can only result from close collaboration between the surgeon and limb-maker. A high degree of æsthetic result has been achieved by using acrylic as the basis for the prosthesis and the patients in this group continue to wear them. The value of the procedure depends also on selection of cases.

L. T. BARCLAY

Mandibular Tumours—A Clinical Roentgenographic and Histopathologic Study. Byars, L. T. and Sarnat, B. G.: *Surg., Gyn. & Obst.*, **83**: 355, 1946.

"The diagnosis of ameloblastoma (adamantinoma) of the mandible has been made frequently by the use only of the roentgenogram." This is an unsafe practice for the roentgenologic picture is not diagnostic.

Two groups of tumours are described: the first proved ameloblastomas with roentgenological features characteristic of other jaw tumours; the second, a group of multilocular appearance, radiologically, which were proved not to be ameloblastomas.

Twelve cases are detailed including roentgenograms and microphotographs in illustration. They contend that the primary value of the roentgenogram is to demonstrate the site and extent of the lesion in the mandible.

L. T. BARCLAY

Cancellous Bone Grafts for Infected Bone Defects. A Single Stage Procedure. Coleman, H. M., Bateman, J. E., Dale, G. M. and Starr, D. E.: *Surg., Gyn. & Obst.*, **83**: 392, 1946.

The problem of infected compound fractures following war wounds at Christie Street Hospital has been dealt with by applying the methods advocated by Mowler and his colleagues: using penicillin intramuscularly, the sequestra and scars are removed, cancellous chips from the crest of the ilium are used to fill the bony defect, and the skin is closed, with skin grafting if necessary.

During the past year 52 such cases have been operated upon, with 92% success. No virulent infections have resulted. In addition, cases in which traumatic osteomyelitis and arthritis were similarly treated by cancellous chips after sequestrectomy, healed and fused successfully. Rapid healing prevents irremediable disuse changes.

Success depends on complete removal of infected tissue, adequate vascular beds for grafts, removal of all cortex from the iliac chips, absence of dead space, penicillin and/or sulfonamides generally and locally, full thickness skin covering, and plaster immobilization. The authors used a powder of 100,000 units of penicillin in 20 grams of sulfathiazole for local dusting.

This procedure is similar to that of the Hill End group in St. Alban's, England.

BURNS PLEWES

Intraperitoneal Administration of Succinylsulfathiazole and Phthalylsulfathiazole. Young, J. P., Jr. and Cole, W. H.: *Arch. Surg.*, **53**: 182, 1946.

Innumerable reports indicated that the sulfonamide drugs were effective when used intraperitoneally against peritonitis. Most surgeons abandoned their intraperitoneal use when penicillin was made available, because it appeared to be more effective than the sulfonamide compounds. Penicillin appears definitely to be more helpful against colon bacilli. There would appear to be a need for an antibiotic agent effective against the escherichia coli. Several writers have shown that when given orally succinylsulfathiazole and phthalylsulfathiazole are capable of reducing the number of bacteria, particularly escherichia coli, in the fæces to a remarkably low number. Per gram of drug, phthalylsulfathiazole is about twice as effective as succinylsulfathiazole. The authors experimented on animals injecting separately the latter two drugs into the peritoneal cavities of dogs. They found that 1 gm. of succinylsulfathiazole per kilogram of body weight and 1 gm. of the phthalylsulfathiazole were tolerated without any evidence of toxic reaction. Up to date, Young and Cole have used these drugs intraperitoneally on fifty-one patients. In 28 patients, succinylsulfathiazole was used and in 23 phthalylsulfathiazole was used in a dose of 6 gm. for an adult which is approximately 0.1 gm. per kilogram of body weight. The rate of disappearance from the abdominal cavity is much more rapid than either sulfathiazole of sulfadiazine.

Because of the preliminary nature of this report, the authors have not attempted to evaluate the efficacy of succinylsulfathiazole or phthalylsulfathiazole in reducing postoperative peritonitis or other complications.

G. E. LEARMONTH

Carcinoma of the Stomach. Hudson, P. B. and Alt, R.: *Am. J. Surg.*, **72**: 202, 1946.

A study of 60 cases of carcinoma of the stomach seen in a small community hospital was undertaken. The clinical impression that symptoms are late in appearing and that few are diagnosed early enough to expect cure by surgery were confirmed. An average of 12.4 weeks were spent on preliminary trials of treatment by alkali, diet, bowel management, etc. The average patient lived only eight months after the initial appearance of symptoms.

The commoner symptoms were, in order of frequency: chronic upper abdominal pain, vomiting, acute abdominal pain, indigestion, anorexia, weight loss, asthenia, hæmatemesis, vertigo, regurgitation. No macrocytic anæmia was seen, the average hæmoglobin being 63.7%. X-ray diagnosis increased in accuracy from 85 to 95% between 1917 to 1937 and 1938 to 1945. In several cases the x-ray report was inconclusive till repeated.

Two-thirds of the cases were reported primary adenocarcinoma by the pathologist. One case showed concomitant primary carcinoma of the rectum. Three were linitis plastica. Two originated in pre-existing polyps. Only 30% of the cases were apparently free from metastases by gross examination before and during operation. Twenty-five of 60 cases were described as Grade III or IV malignancies.

On these 60 patients, 16 curative operations were attempted, 17 palliative operations were done, and 30% were closed after exploration only. Six patients of the 16 resected survived, a 10% survival rate, (though two of these have not reached the five year postoperative stage).

The authors conclude that present methods are "sadly inadequate" and make a plea for co-ordinated research.

BURNS PLEWES

A propos de 25 cas d'ulcères gastro-duodénaux traités par la splanchnicectomie et l'ablation du premier ganglion lombaire. Froehlich, F.: *Presse Méd.*, **24**: 336, 1946.

25 cas traités depuis 1942 par la splanchnicectomie. Dans l'ensemble les résultats ne sont guère favorables contrôlés par le temps. L'auteur en convient le premier. 14 opérés offrent de bons résultats après 4 ans. Les autres malades n'ont pas vu leur maladie ulcéreuse guérir, sans que l'auteur soit en mesure de les différencier des autres.

Il est probable que les deux splanchniques (gauche et droit) agissent sur l'ensemble des fonctions gastriques, sans que l'on puisse, à l'heure actuelle, discerner leur part respective dans la pathologie digestive.

Tout le problème ulcéreux devrait être revu sous l'angle endocrino-sympathique.

PIERRE SMITH

Traitement du cancer du rectum par l'amputation abdomino-périnéale en un temps avec conservation sphinctérienne. Sénèque, J.: *Presse Méd.*, **31**: 452, 1946.

A la suite d'une communication de W. Babcock de Philadelphie au congrès international de chirurgie de Lima, en avril 1946, communication illustrée d'un film en couleurs, le professeur Sénèque vivement impressionné par la technique décrite s'est rendu à Philadelphie dans le service de Babcok au Temple University Hospital afin d'assister à une opération de cancer du rectum réalisée selon cette technique même et d'en observer les résultats. De retour à Paris, Sénèque a opéré lui-même plusieurs cas en suivant la technique Babcock et s'en est déclaré satisfait, du moins lorsqu'il s'agit de cancers hauts situés de l'ampoule rectale.

L'amputation abdomino-intrasphinctérienne de Babcock n'est pas nouvelle dans son principe, mais dans sa réalization, en ce sens qu'elle permet—et Sénèque l'a constaté—une cicatrisation en dix jours, sans anus préalable, avec conservation sphinctérienne.

Soins pré-opératoires minutieux à base d'huile de ricin et d'huile sulfamidés. Anesthésie à la rachipercaïne. Incision de Jalaguier étendue, mobilisation du côlon gauche, et ligature de la dernière sigmoïdienne pour permettre le déroulement du côlon sigmoïde; ceci dans le temps abdominal. Dans le temps périnéal: incision intra-sphinctérienne jointe à une fente verticale postérieure pour libérer la partie basse et descendre l'intestin et le néoplasme à travers l'appareil sphinctérien.

Les avantages de l'opération de Babcock sont: une bonne exploration de l'abdomen, des risques de récidives moindres que dans la résection abdomino-sacrée, pas de douleurs ou d'ostéites post-opératoires, pas de risque de fistule sacrée ni d'aléas d'une suture colo-rectale et réduction considérable de la durée du traitement.

Par contre, les qualités physiologiques fonctionnelles post-opératoires sont supérieures après une résection qu'après une amputation intrasphinctérienne avec abaissement colique. Inconvénient qui ne suffit pas à condamner l'intervention de Babcock en regard des avantages considérables qu'elle procure et le lever précoce qu'elle permet. PIERRE SMITH

Plastic Surgery and Burns

Present Evaluation of the Merits of the Z-Plastic Operation. Davis, J. S.: *Plastic & Reconstructive Surg.*, **1**: 76, 1946.

The Z-plastic manœuvre is based on the transposition of two triangular flaps formed by the Z incision. Its success depends on the presence of lax tissue on each side of the contraction. The ideal place for the use of the Z-plastic, single or in series, is in those instances where a web exists and the skin is of normal texture. Thus the method is applicable in the treatment of congenital webbing of neck, popliteal space, and in partial syndactylism. Congenital grooves around fingers, wrists, arms, toes and legs may be treated by the Z-plastic. It is commonly used in the treatment of deformities due to scar contracture. Thus a knowledge of the utilization of scar tissue in the final repair is essential. The patient should be in excellent physical condition preoperatively. Operation is delayed until six months after healing. Failure may result from too early operation.

With the scar bridle under tension the incision is marked with 5% brilliant green in alcohol. The central line of the Z is drawn along the most prominent part of the web. The arms of the Z are drawn parallel to each other, of equal length, and at 60°, to the central line. Angles between 60 and 20° can be used depending on the elasticity of the surrounding skin, the thickness of the flaps essential to viability, the location of the contraction, and the contour of the part. Flaps are undercut and transposed. The sutured wound is Z shaped but turned at approximately 90° to the original Z, is elongated, and the central line lies transversely. Cyanosis of the tips of the flaps may be treated by a few puncture wounds made by a pointed knife, gentle massage, or the application of cold, sterile, normal saline compresses. Flaps should be handled with small sharp hooks. A voluminous pressure dressing is applied. All stitches are out by the 10th day. Massage is started after three weeks and continued for several months.

When the Z incision, single or in series, is used on the fingers or wrist, flaps should be short. The use of multiple Z's in long contracted scars is valuable. The full amount of relaxation required may not be obtained by the first Z-plastic. After six months, during which the tissues have been softened, and circulation improved, by massage, further relaxation may be obtained by repeating the Z-plastic. STUART GORDON

Early Covering of Extensive Traumatic Deformities of the Hand and Foot. McDonald, J. J. and Webster, J. P.: *Plastic & Reconstructive Surg.*, **1**: 49, 1946.

The closure of an open wound as soon as possible is a fundamental surgical principle. Early closure should be done by the most practical means in the absence of complications. If immediate closure is not possible, primary healing may be obtained by secondary closure. Neglect in early closure of wounds of hand or foot results in penalties costly and frequently permanent. Later reconstructive measures are more difficult.

If remaining viable skin flaps can be closed without tension this should be done. A split thickness graft can be used to cover larger denuded areas. This may be permanent if the bed is fat or muscle. Local flaps may be used for covering important structures, the bed of the flap being covered by a split skin graft.

Marked saving in time may result from the use of an immediate pedicle graft. If this is not practical, immediate covering by split thickness graft should be done. Later this can be replaced by a pedicle graft.

Local closure should be delayed if other serious injuries are present, or when injury is so extensive that gangrene or infection is feared. Immediate local treatment is limited to debridement, application of a nonadherent pressure dressing, and immobilization. Chemotherapy should be instituted. Four or five days later if the patient is out of danger the wound is further debrided and covered with a graft.

The impression that the plastic surgeon can always be relied upon to salvage and restore the damage deserves contradiction. Consultation with the Plastic Service on all emergency cases in which there is loss of tissue allows adequate early treatment of tissue losses in hand and foot. STUART GORDON

Obstetrics and Gynæcology

The Aspiration of Stomach Contents into the Lungs During Obstetric Anæsthesia. Mendelson, C. L.: *Am. J. Obst. & Gyn.*, **52**: 191, 1946.

Gastric retention of solid and liquid material is prolonged during labour. Aspiration of vomitus into the lungs may occur while the laryngeal reflexes are abolished during general anæsthesia. Bronchial configuration favours right-sided aspiration. Massive aspiration, however, readily involves both lungs.

Liquid material is more frequently aspirated than solid. Aspiration of solid material usually produces the classical picture of laryngeal or bronchial obstruction. Aspiration of liquid produces an apparently hitherto unrecognized asthmatic-like syndrome with distinct clinical, roentgenologic and pathologic features. The syndrome is due to the irritative action of gastric hydrochloric acid, which produces bronchiolar spasm and a peribronchiolar exudative and congestive reaction.

Aspiration of stomach contents into the lungs is preventable. The dangers of this complication as an obstetric hazard may be avoided by: (*a*) withholding oral feeding during labour and substituting parenteral administration where necessary; (*b*) wider use of local

anæsthesia where indicated and feasible; (*c*) alkalinization of, and emptying the stomach contents prior to the administration of a general anæsthesia; (*d*) competent administration of general anæsthesia with full appreciation of the dangers of aspiration during induction and recovery; (*e*) adequate delivery-room equipment, including transparent anæsthetic masks, tiltable delivery table, suction, laryngoscope and bronchoscope; and (*f*) differential diagnosis between the two syndromes described and prompt institution of suitable therapy.

ROSS MICHELL

Pathology

The Pathological Anatomy of Sudden Heart Death. Munck, W.: *Acta Pathologica et Microbiologica Scandinavica*, **23:** 107, 1946.

This article analyzes 500 cases of sudden death due to heart disease, all of which had post mortems performed under medico-legal auspices at the Medico-Legal Institute of the University of Copenhagen. The material comprised 411 men and 89 women, the difference in sex incidence being due to the fact that autopsies are more frequently performed for medico-legal and insurance purposes on men. There is a careful statistical study of the pathological findings with abbreviated case histories and some discussion of the literature.

The article is of interest to North American physicians because it discusses chiefly European literature on the subject and provides an opportunity for comparison. The series of cases is sufficiently large for its statistical analysis to be of real significance; in general the results confirm previous opinions; 334 cases or 79.2% showed coronary sclerosis of appreciable extent: in 141 cases coronary thrombi were found, of which 105 lodged in the left coronary artery, 3 in the left circumflex, and 34 in the right coronary artery. In one case multiple thrombi were found. Cardiac rupture was noted in 26 times or 6.5% of 396 cases of coronary sclerosis. One instance of coronary thrombosis on a traumatic basis is recorded: death occurred a few hours after a blow on the chest by a log, and a fresh thrombus was found at post mortem.

Syphilitic heart disease was found as a cause of death in 58 cases or 11.6%, while valvular disease accounted for 18 deaths or 3.6% and congenital heart disease for 9 deaths or 1.8%. The cases of congenital heart disease are of some interest in that some very rare deformities are described.

DOUGLAS FINDLAY

Urology

Neoplasms of the Testis. Auerbach, Lieut. O. (M.C.), U.S.N.R., Brines, Capt. O. A. (M.C.), U.S.N.R. and Yaguda, Com. A. (M.C.), U.S.N.R.: *J. Urol.*, **56:** 368, 1946.

This article reports a series of 26 cases of neoplasms of the testis seen between January 1, 1943, and January 1, 1946 at the United States Naval Hospital in Brooklyn. As this was one of the two naval hospitals designated for the treatment of malignant disease, the series represents the incidence of testicular neoplasms in a large population which cannot be exactly counted. It is also a select population in that only moderately young adult males in good initial physical health are included. This is of some importance in assessing the figures, because as the authors point out, undescended testicle is ground for rejection in the U.S. Navy, and this factor of possible etiologic significance is therefore excluded.

Neoplasms occurred in both sides in about equal frequency: one case of bilateral tumour is noted. Painless enlargement of the testicle was the most frequent presenting symptom: the pattern of metastases was highly characteristic, in no case was evidence of direct extension seen, but metastases were found regularly in the retroperitoneal lymph glands at the level of the cœliac axis, in 10 cases invading the inferior vena cava, in 18 cases in the liver, in 22 cases the lung, and in 26 cases cases in the mediastinal lymph nodes. The time of death from the onset of symptoms varied between 4 and 39 months. The authors are unwilling to classify their material pathologically, as they feel that as yet no satisfactory classification has been proposed: there is however, an illuminating discussion of this question.

DOUGLAS FINDLAY

Urinary Extravasation: A Study of Sixty Cases. Howland, W. S.: *J. Urol.*, **56:** 387, 1946.

The author points out that from the clinical point of view urinary extravasation and periurethral abscess are but two stages of the same process. His series of 60 cases comprises 29 cases of periurethral abscess in which the extravasated urine was limited to the space bounded by Buok's fascia and 31 of true urinary extravasation. This series originated in Atlanta, Georgia, and all but two of the patients were coloured.

Urethral stricture was responsible for 49 cases, the remainder were due to a variety of causes, among them catheterization, calculi, gunshot wound, and external trauma. Of the series, 5 patients died. Treatment consisted of chemotherapy using sulfonamides and penicillin. Suprapubic cystotomy was required in 51 cases. The author attributes the low mortality rate of about 8% (as compared to previously reported series of 50%) to the use of chemotherapy.

DOUGLAS FINDLAY

Neurology

Fatal Aplastic Anæmia Following the Use of Tridione and a Hydantoin. Harrison, F. F., Johnson, R. D. and Ayer, D.: *J. Am. M. Ass.*, **132:** 11, 1946.

A sixteen-year old girl was treated for seizures with tridione and methylphenylethyl hydantoin (mesantoin) over a period of six months. She developed an aplastic anæmia with a pan-cytopenia. White cells and platelet counts fell progressively in spite of frequent transfusions and other therapy given to stimulate hæmopoiesis. It was felt that the drugs given were the etiological factor.

PRESTON ROBB

Aplastic Anæmia and Agranulocytosis Following Tridione. Mackay, R. P. and Gollstein, W. K.: *J. Am. M. Ass.*, **132:** 13, 1946.

Tridione has been shown to be an effective anticonvulsant particularly in the control of petit mal and psychomotor seizures. However it is possible when the drug is used over a long period of time to produce an aplastic anæmia. If the drug is being used the blood should be checked regularly to look for early signs of this condition.

The authors report a case of a twenty-four year old female who had taken tridione (3, 5, 5, trimethyloxazoline-2-4-dione) and phenobarbital for ten months in fairly effective doses. Seventeen days after the onset of headache, weakness and fatigue, the patient died of aplastic anæmia, agranulocytosis and thrombocytopenia. Autopsy revealed extensive hæmorrhages throughout the body.

(It is worthy of note that in the same issue of this journal [*J. Am. M. Ass.*] a letter to the editor reports a third case of aplastic anæmia following the use of tridione. This patient recovered.)

As precautionary measures it was suggested that the drug should not be administered in any patient who has had a blood dyscrasia. Other measures of controlling the seizures should be tried first. It should be used in small doses at the start. The blood cells and platelets should be examined frequently, the interval not being more than a month. Patients should be instructed to report any unusual symptoms. Unprescribed sale of the drug should not be allowed.

Despite the unfortunate toxic effects of tridione revealed in this case, the drug offers great promise for effective control of the most stubborn of all convulsive disorders, if its dangers can be avoided.

PRESTON ROBB

Hygiene and Public Health

Effect of Double-Bunking in Barracks on the Incidence of Respiratory Disease. By the Commission on Acute Respiratory Diseases, Fort Bragg, North Carolina: *Am. J. Hyg.*, **43:** 65, 1946.

That there is no objection to the general use of double-bunking in barracks, provided that overcrowding is avoided, was the conclusion reached after a study was conducted into its effect on the incidence of respiratory disease in a battalion of newly recruited soldiers. The investigation was conducted in the Field Artillery Replacement Training Centre. Observations continued through a 17-week period of training. Alternate barracks were equipped with double bunks, the others with standard army single beds.

Information regarding the incidence was obtained from dispensary and hospital records, the data from the hospital records being more specific than that from the dispensary records. In the hospitals, the detailed clinical, laboratory and epidemiological techniques employed made diagnosis possible according to the following criteria: acute respiratory disease of unknown etiology (ARD); atypical pneumonia, influenza A, and hæmolytic streptococcal pharyngitis.

Tables and figures are included to show the findings. Although it was felt that further studies are necessary before adequate evaluation can be made, the results were nevertheless significant. During a period of epidemic of acute respiratory disease the incidence of hospitalized cases was significantly lower among the men living in double-bunked barracks than among the men in the control barracks. A similar effect was observed for primary atypical pneumonia but the number of cases was too small to warrant conclusion. The peak of the epidemic of influenza occurred while the battalion was engaged in a field manœuvre and it was therefore impossible to evaluate the effect of double-bunking on the incidence of this disease. The cases of hæmolytic streptococcal pharyngitis were confined to a small section of the battalion. All did not have equal exposure and it was therefore impossible to determine the influence of double-bunking on this disease also.

It is suggested that double-bunking might have its greatest effect on reducing the severe illnesses and little or no effect on milder cases. MARGARET H. WILTON

Cardiovascular Impairments in the Industrial Worker. Connell, W. F.: *Indust. M.*, **15:** 442, 1946.

The author's conclusion that individuals with quite important heart disease are just as efficient, within their limits, as those with completely normal hearts, is stressed in this article. The average cardiac patient may, with proper handling, continue as a valuable economic asset for years after his disease first develops. The proper assessment and placement of these individuals in industry is an individual problem entailing a careful diagnostic study, together with an accurate evaluation of the functional and therapeutic status. The type of occupation for which the individual has been trained, must be considered. The author warns against undue solicitude and anxiety.

Excellent criteria for the proper classification of cardiovascular patients are to be found in the publications of the New York Heart Association. The Therapeutic Classification as prepared by this Association is an excellent guide to follow. Cases are classified as: Class A—Physical activity need not be restricted. Class B—No unusually severe or competitive efforts are permitted. Class C—Ordinary physical activities are moderately restricted. Class D—Ordinary physical activities are markedly restricted.

The author illustrates the manner in which this guide may be used by reviewing the clinical pictures presented, together with assessment and classification, of such conditions as high blood pressure, coronary heart disease and valvular heart disease. MARGARET H. WILTON

OBITUARIES

Dr. Alexander C. Beatty died suddenly on September 14. He was born October 10, 1860, near Garden Hill and has been a resident of the vicinity all his life. He was educated at Port Hope High School and attended Trinity Medical College, graduating with the class of 1890. With the exception of one summer's practice with Dr. E. Clarke of Cobourg, Dr. Beatty has served as family doctor to the neighborhood of Garden Hill since graduation.

His ability was not limited to the medical field however, as he founded and was the present owner of the Beatty Telephone System which today serves a great part of Hope township. He was a member of the Telephone Pioneers of America.

He is survived by his widow.

Dr. Seraphin Boucher former director of the Montreal Health Department, died October 6, in his 80th year at his home in Montreal.

Dr. Boucher was born at Sault-au-Recollet in 1865. After his classical studies at the Montreal College, he obtained his degree in medicine from the Victoria Medical School in 1889.

Following postgraduate work in France, he returned to Montreal to practise, later, receiving a diploma in public health from Laval University in Montreal, now the University of Montreal.

Dr. Boucher was appointed director of the Montreal Health Department in 1913, holding that office until December, 1937, when he was succeeded by Dr. Adelard Groulx.

A member of the Royal Sanitary Institute of London and of the American Public Health Association with which he held the office of first vice-president, Dr. Boucher was professor emeritus at the University of Montreal, member of the Cercle Universitaire, former chairman of the medical board of the Ste. Justine Hospital, governor of Notre Dame and Ste. Justine Hospitals, former administrator of the Caisse Nationale d'Economie and several other organizations.

McGill University awarded him an honorary degree of LL.D. in 1934 for his leadership and knowledge in public health.

He is survived by five sons and four daughters.

Dr. James Deacon Bruce, aged 73, vice-president emeritus of the University of Michigan and past president of the American College of Physicians, died September 5, at Ann Arbor, following a cerebral hæmorrhage. He was a native of Blackstock, Ontario.

He served with the British forces in 1916 as chief of medical services at Duchess of Connaught Hospital in Clivedon, England, and joined an American hospital unit when the United States entered the war.

Dr. Bruce became chief of the medical service at University of Michigan in 1935.

Dr. Thomas Wilfred Hamilton, aged 51, medical superintendent at Fort San, Saskatchewan since 1933, died there September 3. Born in Crandall, Manitoba, Dr. Hamilton graduated from the Manitoba Medical College in 1921, and was appointed to the staff at Fort San immediately following his graduation. He took postgraduate courses in Chicago and London, England. Dr. Hamilton was a member of both Masonic order and Kiwanis club at Fort Qu'Appelle, Saskatchewan. He is survived by his widow and two sons.

Dr Louis Lévesque est décédé le 29 août, à Rivière-Bleue, à l'âge de 47 ans. Feu le Dr Lévesque a fait ses études au collège de Ste-Anne de la Pocatière et ses études médicales à l'Université Laval. Il pratiquait à Rivière-Bleue depuis 1927 et sa mort cause de vifs regrets.

Il laisse dans le deuil, outre son épouse, une fille, deux frères et quatre sœurs.

Dr. R. W. MacCharles died in the Winnipeg General Hospital on September 16 after a long illness. Born in Cape Breton, N.S. 88 years ago, he graduated in medicine from Dalhousie University in 1891, and practised in Cypress River, Manitoba for two years, then moved to Manitou in 1895 and was there for thirty-two years. In 1927 he came to Winnipeg and practised until his retirement in 1941. He was an elder in the Presbyterian church and during his stay in Winnipeg was an active member of Chalmers United Church. He is survived by a daughter and two sons, one of whom is Dr. M. R. MacCharles of Winnipeg.

Dr. Archibald George McPhedran died on September 18 at his home in Toronto after eight months' illness.

Dr. McPhedran served for 10 years as a missionary under the Presbyterian Church of Canada in Central India. He was born near Wyoming, Ontario, and graduated in arts from the University of Toronto, winning a gold medal in physics. In 1901 he graduated in medicine and took postgraduate study in London, England and went to India in 1906. Retiring from missionary service in 1916 because of climatic conditions, he returned to Toronto and established a general practice.

Dr. McPhedran was former member of the faculty of medicine, University of Toronto and also the Toronto General Hospital. He was an active member and elder in West United Church. He was twice married. His wife by the first marriage died in 1917.

Surviving are his widow, two sons and a daughter.

Dr Henri Racicot est décédé, récemment, au pavillon LeRoyer de l'Hôtel-Dieu, à l'âge de 36 ans. Il avait servi durant quatre années dans le Corps d'aviation canadien; au moment de sa mort, il était directeur médical de la compagnie des produits pharmaceutiques Ciba. Son décès prématuré a douloureusement surpris ses chefs et ses camarades.

Le Dr Racicot laisse sa femme; un fils; son père et sa mere; et une soeur.

Dr. Eugene St. Jacques, well-known local surgeon, died in St. Jeanne d'Arc Hospital, Montreal, in his 75th year September 19, following a long illness.

Chief surgeon at Ste. Jeanne d'Arc since 1927, he was also professor of pathological anatomy, clinical surgery and history of medicine at the University of Montreal and was widely known in the United States and Europe. He won the Montyon Prize in 1927, awarded by the Academie de Science in Paris for his work entitled "Memoir on the treatment of infections by intravenous carbon".

Dr. St. Jacques was born at St. Hyacinthe in 1872 and obtained his B.A. at the seminary there. He graduated from Laval University with his degree in medicine in 1897. Following his graduation he studied for three years in New York, Paris, Brussels, London, Berlin and Bonn.

He was a member of the Fellow Canadian College of Surgeons, the Fellow American College of Surgeons, the Society of Clinical surgeons, the International Society of the History of Medicine, and almost every local surgical board.

He is survived by his widow, a daughter and three sons.

Dr. D. I. Snider, well-known Kingsville physician and coroner of that town, died suddenly on September 9. He was 46 years of age. He was born in Smithfield, Ontario, where he received his primary education. He attended high school in Windsor and was a graduate of the faculty of medicine, University of Toronto, in 1923. He practised in Harrow for four years before taking over the professional services of Dr. J. F. Lee in Kingsville.

In July, 1941, Dr. Snider was appointed temporary medical officer of health and became permanent M.O.H. in March of this year. He was a member of the Kingsville Lions Club, ex-officio member of the Victorian Order of Nurses board, and member of the Essex County Medical Society and board of the new hospital in Leamington.

Surviving besides his father, are his widow and three sisters.

NEWS ITEMS

Alberta

The construction of a new fifty bed hospital in the Wainwright district to cost $200,000.00, has received the support of the villages of Chauvin, Edgerton and Irma.

The Alberta Tuberculosis Association may bring their two mobile chest units to Calgary during October, for a period of four months, to make a survey of the people of this city.

District Medical Society No. 7, Camrose, held a meeting on September 10, at the Alice Hotel, Camrose. The meeting took the form of a dinner meeting. Fifteen members and five guests were present. The guests were Dr. Harold Orr, President of the Alberta Division; Dr. D. B. Layton, Director of Venereal Disease Control, Ottawa; Dr. G. Tucker, Edmonton; Dr. D. R. Easton, Edmonton; and Dr. W. Bramley-Moore, Secretary of the Alberta Division. Following the business part of the meeting, Dr. Orr spoke briefly on the United Nations Health Organization; and Dr. Tucker gave a brief concise paper on urinary tract infections.

At a meeting of the Council, College of Physicians and Surgeons of Alberta, held in Edmonton on September 6, 75 applications for registration to practice medicine in the province of Alberta were approved. With few exceptions these were all returned men.

The council also discussed schedule of fees. The Registrar was instructed to find out from members their wishes in regard to the use of one fee schedule only in the province, this schedule being used not only in private practice but for Family Doctor Scheme, Workmen's Compensation Board, Cancer Service, etc. The Workmen's Compensation Board were asked to consider adopting the schedule of fees approved for use in the Family Doctor Scheme.

The last of the wartime speed-up courses in medicine at the University of Alberta has just completed examinations. Convocation will take place on October 5, 1946.

Seventy cases of infantile paralysis have been reported in this Province to October 1.

G. E. LEARMONTH

British Columbia

Dr. W. H. Hatfield, Director of the Division of Tuberculosis Control for B.C. has recently been honoured by the Surgeon General's Department of the United States by being invited to become a consultant in their tuberculosis program.

Dr. D. B. Avison, who has been Director of the Okanagan Valley Health Unit, has resigned and is to take up new duties as regional medical director in China, for U.N.R.R.A.

Vancouver has recently been visited by a further group of experts prominent in the field of medical education. In the group were: Dr. Herman G. Weiskotten, Dean of Syracuse University College of Medicine, Dr. L. R. Chandler, Professor of Surgery and Dean of Stanford University School of Medicine, and Dr. Victor Johnson, Secretary of the Council on Medical Education and Hospitals of the American Medical Association. These men form part of a board of experts, who are preparing a report for the Board of Governors of the

University of British Columbia, on the question of the institution of a Faculty of Medicine.

Lieut.-Col. E. F. Christopherson has recently returned from overseas and will shortly be resuming practice in Vancouver. For the past year Colonel Christopherson served as Officer in Charge of Medicine of 22 Canadian General Hospital at Bramshott.

Among those recently discharged from the forces are: Lieut-Col. G. W. C. Bissett, Major C. G. G. Maclean, Capt. G. O. Hallman, Capt. E. L. Margetts, Capt. J. A. MacLaren, Capt. C. J. F. Phillips-Wooley.

The number of doctors registered in B.C. has now reached 1,350, an increase of almost 500 since 1939. In the past year there has been a total of 232 new registrants.

Annual meetings of the following District Medical Associations have been held:

East Kootenay Medical Association Annual Meeting at Cranbrook on the afternoon and evening of September 30. West Kootenay Medical Association at Trail on the afternoon and evening of October 2. District No. 4 Medical Association at Penticton on the afternoon and evening of October 4. Victoria Medical Society on the evening of October 7.

Dr. Ethlyn Trapp, President of the British Columbia Medical Association, accompanied by Dr. Karl Haig of Vancouver, Dr. D. W. Johnstone, Department of Veterans' Affairs, and Dr. M. R. Caverhill, Executive Secretary, attended these meetings together with Dr. A. E. Archer, Consultant in Economics of the Canadian Medical Association.

The Annual Fall Meeting of the North Pacific Society of Internal Medicine, was held in Vancouver on September 6 and 7. British Columbia doctors presenting papers at these meetings were Dr. G. F. Strong, Dr. D. E. H. Cleveland and Dr. W. W. Simpson.

The Vancouver Medical Association's Twenty-fourth Annual Summer School held September 9 to 13 inclusive, at the Hotel Vancouver, was most successful, both from the standpoint of the high quality of the scientific program, and the record peace-time attendance, which reached a total of 404.

Among the scientific speakers were Dr. Elmer Belt, Urologist, of Los Angeles, Dr. Simeon T. Cantril, Director of the Tumour Institute of the Swedish Hospital, Seattle, Dr. Russell L. Cecil, Professor of Clinical Medicine, Cornell University, Medical College, New York, Dr. J. R. Lindsay, Professor of Surgery (Otolaryngology), University of Chicago, Dr. Roy D. McClure, Surgeon-in-Chief, Henry Ford Hospital, Detroit, and Dr. N. W. Philpott, Department of Obstetrics and Gynæcology, McGill University, Montreal.

Dr. E. L. Turner, Dean of Medicine of the University of Washington, was the speaker at the annual dinner.

The golf tournament at Capilano Golf and Country Club proved to be a most popular event, attracting a large number of enthusiasts. M. R. CAVERHILL

New Brunswick

Among physicians opening new practices in New Brunswick are Dr. Clarence Bourque at St. Leonards and Dr. Rino Fournier at Edmundston.

At Saint John Dr. Frank Stuart, Dr. V. M. Zed and Dr. F. H. George have begun practice on discharge from the army.

Dr. J. A. Melanson, chief medical officer of N.B. Department of Health, was the principal speaker at the annual meeting of the Association of Registered Nurses at St. Stephen. He discussed the organization and growth of the Department of Health in New Brunswick. In this department the nursing profession is taking a much greater degree of importance each year as qualified Health Nurses become available.

Dr. Stephen D. Clark of Lancaster, N.B., fishing on the fabled Miramichi, recently hooked a 22 lb., four-foot salmon and landed it after a struggle lasting an hour. Just another example of special skills exhibited by our profession.

Dr. Murray Angevine, Professor of Pathology at the University of Wisconsin, was the special speaker at the Monthly Meeting of the Saint John Medical Society, his subject "Pathology of arthritis" was presented to a large gathering who welcomed the speaker to his home town in the very warmest manner. At the social period at the evening's end Dr. Angevine informally discussed many other modern trends in diagnosis and treatment.

The New Brunswick branch of the Canadian Cancer Society has announced a general meeting under the provincial chairman, Dr. Milton Gregg, V.C. to formulate a campaign of Education sponsored by the society.

Dr. L. L. Frenette of Bathurst, addressed the graduating class of nurses from the Hotel-Dieu Hospital, Bathurst at the recent graduating exercises.

Dr. E. A. Petrie, Radiologist of St. Joseph's Hospital, Saint John, attended the annual meeting of the Canadian Society of Radiographers at Niagara Falls. Dr. Petrie is the Maritime Representative in the Society's Board of Examiners. A. S. KIRKLAND

Nova Scotia

At the graduation exercises of the School of Nursing of the Victoria General Hospital, Halifax, Dr. H. K. MacDonald gave the address to the graduates, recalling the history of nursing in that institution and his own experience in over fifty years of practice.

Dr. D. J. Tonning, Assistant Professor of Medicine, Dalhousie University attended the meeting of the New Brunswick Medical Society where he contributed a paper.

Just when the physicians of Nova Scotia were expressing the hope that the epidemic of acute anterior poliomyelitis would pass us by, a number of cases occurred, with one death. Excellent results have followed the treatment of new and old cases at the clinic, at the Nova Scotia Hospital, Woodside, under the direction of Dr. C. E. Kinley.

The appointment has been announced of Doctor D. M. Grant as Medical Officer of the Workmen's Compensation Board. Dr. Grant practised at Noel for several years until the outbreak of war when he joined the Royal Canadian Air Force. Since his discharge he has been practising in Middleton.

During the meeting of the Association of Compensation Boards of Canada, held at Halifax in September, the medical officers from the various provinces had an opportunity to visit the Anatomy Department of the Dalhousie Medical School, where Professor Mainland gave a number of interesting demonstrations. They also visited Camp Hill Hospital to confer with Dr. Henderson of the Pension's Branch on post traumatic disability evaluation.

The medical student apprenticeship scheme which was tried out this summer by the Dalhousie Medical School has apparently been a great success. A number of students who had advanced sufficiently far in their work were permitted to associate themselves with physicians in general practice under their supervision. They saw the work in the office and outside the office. It no doubt sharpened the doctor to deal with numerous daily questions, and gave the student valuable experience in meeting the sick. H. L. SCAMMELL

Ontario

The Toronto Academy of Medicine held the opening meeting of the 1946-1947 session on October 1. Two hundred Fellows with delegates from Hamilton Academy, London Academy, Academy of Dentistry, Canadian and Ontario Medical Associations and a number of distinguished guests met at dinner in Casa Loma. The President Dr. George Boyer was in the chair and presented the past president's badge to Professor William Boyd whose year of office ended last May. The address of the President will be published in the Bulletin of the Academy.

Hon. and Rev. H. J. Cody, Chancellor of the University of Toronto reviewed the work of the year in the Faculty of Medicine, and Mr. Sidney Smith, President of the University also addressed the gathering. The association of the University and the Academy is intimate. An interchange between the libraries has long been in operation. Hon. George Drew, Premier of Ontario, enjoyed his meeting with the Academy and said so. A misconception of the Academy as being more or less of a social club was dissipated from his mind. The library of the Academy really serves the practitioners of Ontario rather than confining its services to its own Fellows. The work of the session is well under way in the new home of the Academy at the corner of Bloor West and Huron Streets, Toronto.

Dr. W. V. Johnston of Lucknow, Ontario, Councillor of District 3, O.M.A., addressed a most effective circular letter to his constituents prior to the district meeting held in Walkerton on October 16. It had its effect as shown by the enthusiastic attendance at the meeting. Scientific papers were presented by Dr. Charles C. Ross and Dr. J. H. Geddes, of London, and a long agenda occupied the business meeting until late in the afternoon. The annual dinner was held at Pleasant Valley Farm two miles east of Walkerton. The guest speakers were Dr. C. C. White, president-elect of the Ontario Medical Association and Dr. W. W. Hughes of Embro who is a leading ornithologist. His address was illustrated by a coloured movie film synchronized with recordings of the songs of the birds shown in the picture.

Ontario Medical Association District No. 1 held a two day session in Sarnia October 1 and 2 under the chairmanship of the counsellor, Dr. E. K. Lyons, of Windsor. The first day was given to the business meeting with Prepaid Medical Care and Postgraduate Medical Education as principal features. In the forenoon October 2, a scientific and clinical program was presented by Drs. J. W. Jackson, A. M. Borrowman, J. D. Kingsley, G. B. MacFarlane, C. W. McCutcheon, J. F. Roberts, C. M. Carruthers and J. T. Biehn all of Sarnia. In the afternoon, papers were read by Drs. L. N. Silverthorne, Ian MacDonald and F. G. Kergin of Toronto. The session closed most happily by a dinner at the Sarnia Golf Club at which the guest speakers were Dr. White and Mr. Ralph Rowzee who spoke on synthetic rubber and its future.

Ontario Medical Association District No. 8 held its annual meeting in Ottawa on September 26, with Counsellor H. W. Kerfoot of Smith's Falls in the chair. The business meeting occupied the forenoon and was followed by a buffet luncheon at the Ottawa Civic Hospital. In the afternoon Dr. R. G. Smart and Dr. F. H. Cote, of Ottawa, presented papers and Dr. W. Hurst Brown and Dr. R. C. Laird gave addresses. The meeting closed with a dinner at the Chateau Laurier to which ladies were invited. Dr. C. C. White was the guest speaker.

In Kitchener, October 9, Ontario Medical Association District No. 2 held its annual meeting with Dr. M. C. Harvey in the chair. A business meeting occupied the forenoon and was followed by a luncheon given by the N. Waterloo Medical Society. In the afternoon Dr. Hermann E. Bozer of Buffalo spoke on "Common problems in otolaryngology" and Dr. David K. Miller of Buffalo gave a paper on "Pyrexias of uncertain origin". The dinner was addressed by Dr. C. C. White and a program of entertainment was given.

M. H. V. CAMERON

Prince Edward Island

Dr. J. D. McGuigan, Charlottetown, has spent an enjoyable two weeks visiting relatives and friends in New Glasgow.

Dr. J. F. McNeill, Summerside, has recently returned from Ottawa where he was attending the Executive Council meetings of the Canadian Medical Association.

Dr. C. J. Stogdill, Chief of the Mental Health Division, Department of Mental Health and Welfare, Ottawa, has recently visited this Province. Dr. Stogdill was on a tour of inspection regarding the existing Provincial facilities for the care of the mentally ill. On October 10 and 11 there was held in Ottawa a series of meetings at which provincial and federal men engaged in this work conferred with regard to correcting and improving existing conditions for the care of the mentally ill.

Dr. H. A. Ansley, Assisting Director of Health Services, Department of National Health and Welfare, Ottawa, was in Charlottetown during August, organizing a joint provincial and federal milk survey unit. This unit has its headquarters at the Provincial Laboratory and is now actively engaged in surveying the milk situation throughout the province.

A. J. MURCHISON

Quebec

The Sugar Research Foundation were hosts on September 26 at a dinner in Montreal at the Mount Royal Hotel, to a large group of scientific and business men, both Canadian and American. The work and aims of the Foundation were shown to be directed towards research at leading university laboratories in regard to the rôle of sugar in diet and in scientific and industrial fields. The Foundation has brought together the majority of American and Canadian companies interested in the production and processing of sugar, the common object being that of fact finding in regard to the uses and consumption of sugar. It is frankly admitted that this may lead to greater use of sugar and so be of benefit from a business point of view, but that is not the primary object of the Foundation. In carrying out its program the Foundation which is only three years old, has already established a large number of research fellowships and endowments. These of course began in the United States, but within the last year grants have been made for work in Montreal, under Dr. I. M. Rabinowitch at the Montreal General Hospital, and Dr. Hans Selye at the Université de Montréal. Both these men spoke at the dinner. Dr. Rabinowitch pointed out the growing interrelationship between science and industry and went on to comment on the gaps in our knowledge regarding carbohydrate assimilation. Later he developed the idea that longevity might be very directly dependent on diet.

Dr. Selye's remarks were directed towards the degenerative diseases from the point of view of overactivity of the endocrine glands, and the research which is being done in his laboratory towards their possible control. As his audience was a mixed one he was obliged to reduce technicalities to more popularized form; no easy task, but he had a lucid form of expression which made it appear simple.

Dr. Robert C. Hackett the scientific adviser to the function also spoke briefly about the aims of the Foundation.

On projète à Grand'Mère la construction d'un vaste hôpital, au coût de $600,000. Cet hôpital sera la propriété des Filles de Jésus qui en assureront la direction. Il aura 5 étages et pourra hospitaliser au moins 120 malades.

A la demande de 3 associations britanniques, le ministre de la santé du Royaume-Uni a consenti à mettre à l'essai la vaccination contre la tuberculose par le B.C.G. On devra maintenant fabriquer en Angleterre le vaccin en question et commencer l'expérimentation incessamment.

Les inspecteurs sanitaires du ministère de la Santé et du Bien-Etre social ont fait au cours du mois de juin près de 8000 inspections. Provenant du même ministère on apprend que près de 10,000 personnes ont bénéficié en mai dernier des cliniques antituberculeuses et que 45,000 visites ou examens ont été faits à des nourrissons et à des enfants d'âge préscolaire. Les statistiques provinciales attestent que plus de 300 accidents de tous ordres se sont produits au cours des mois de juillet et août. JEAN SAUCIER

Saskatchewan

The Board of Governors for the University Hospital, University of Saskatchewan consists of Dr. J. S. Thomson, president of the University of Saskatchewan; Dr. W. S. Lindsay, dean of the college of medicine, University of Saskatchewan; L. H. Hantleman of Plato; T. Lax, deputy provincial treasurer; D. Webster, deputy minister of public works; Dr. F. O. Mott, chairman of the health services planning commission; and Dr. C. F. W. Hames, deputy minister of public health.

Appointment of a four-man advisory council for the college of medicine at the University of Saskatchewan, under the provisions of the University act passed at the 1946 session of the legislature, has been announced by Premier T. C. Douglas, minister of health. The members of the council are Dr. W. S. Lindsay, dean of the college of medicine, University of Saskatchewan; Dr. J. F. C. Anderson, Saskatoon; Dr. C. F. W. Hames, deputy minister of public health; and Dr. F. D. Mott, chairman of the health services planning commission.

According to the terms of the act, Dr. Anderson was appointed by and represents the College of Physicians and Surgeons. Dr. Hames and Dr. Mott were appointed by the minister of public health. Dr. Lindsay, as dean of the college of medicine, is a member *ex-officio*.

The duties of the council are to report to the senate and the board of governors of the university concerning entrance qualifications, courses, general regulations and related matters.

General

American Academy of Dermatology and Syphilology.—The fifth annual meeting of the American Academy of Dermatology and Syphilology is scheduled for Cleveland, Ohio, from Saturday, December 7 through Thursday, December 12. This will be the first meeting of the group since December, 1941, and it is expected to attract more than 1,000 members, according to Dr. Osborne.

Most special lectures, special courses and symposia will be presented on the first four days of the week, beginning December 9. It is pointed out that the Academy is chiefly concerned with teaching and in consequence the entire session will be a sort of "postgraduate" seminar for the visiting physicians from all parts of the United States and Canada. The annual banquet will be held Wednesday night of the convention week. Dr. Harold M. Cole of Cleveland is general chairman for local arrangements.

Life Insurance Medical Research Fund.—On September 17, 1946, the Board of Directors of the Life Insurance Medical Research Fund awarded 9 fellowships and 3 grants in aid of medical research in addition to those made previously this year. This brings the number of fellowships awarded in 1946 to 20 and the number of grants this year to 47. The total value of the grants in aid, some of which extend over two or three years, is $633,591. The awards are all in connection with research on fundamental problems of cardiovascular disease or function. Amongst the awards the following are noted:

Postgraduate Research Fellowship to Dr. Hugh Grant Skinner of New Toronto, Ontario, to work at the University of Toronto.

Student Research Fellowship was awarded to Mr. Murray Saffran of Montreal, Quebec, to work at McGill University.

Grant in aid of research was awarded to McGill University of Montreal, for support of research under the supervision of Dr. David W. MacKenzie.

Applications for postgraduate research fellowships for 1947 should be made before January 1, 1947, to the Scientific Director, Life Insurance Medical Research Fund, New York Academy of Medicine Building, 2 East 103rd Street, New York 29, New York. Applications for grants in aid of medical research for 1947 will be received until January 31, 1947. Nominations for student research fellowships in 1947 (which are made by faculty members) should not be made until later in the academic year, but must be received by April 15, 1947. Further information may be secured from the Scientific Director.

K. C. Hossick, of Ottawa, has been named chief of the narcotic division. This division of the Department of National Health and Welfare is responsible for administration of the Opium and Narcotic Drugs Act and for carrying out Canadian commitments in the international regulation of the trade in narcotics.

Prior to joining the health department, Mr. Hossick was for nine years a member of the Royal Canadian Mounted Police as officer in charge of the medical division at headquarters in Ottawa. During World War I he served in France and Belgium in the 13th Battalion, Royal Highlanders of Canada, and later as an administrative officer and secretary with the director general of medical services. Mr. Hossick is a director and vice-president of Associated Medical Services, Inc., Toronto, and is a former executive officer of the Civil Service Association of Ottawa and the Civil Service Federation of Canada.

BOOK REVIEWS

Ancient Anodynes. E. S. Ellis, Late Anæsthetist to the Gloucestershire Royal Infirmary and Eye Institution. 187 pp. 21s. Wm. Heinemann, Medical Books Ltd., 99 Great Russell Street, London, W.C.1, 1946.

This volume gives the results of a life-time of study on the development of our knowledge of drugs for the relief of pain, not only those scientifically recognized, but also of those which in the past, among civilized nations and also aboriginal tribes, have enjoyed a reputation as soporifics or even anæsthetics. Psychological anæsthesia, be it of shrine or hypnotic character, is also dealt with.

A most interesting section has to do with the long history of popular knowledge regarding the effects of ether for everything except the elimination of pain. Its use as an inebriant at so-called ether parties preceded by many years its introduction to scientific medicine as a general anæsthetic. The results of archæological studies having to do with the poppy and opium are also of considerable interest.

There is an excellent foreword by T. K. Penniman, M.A., Curator of the Pitt Rivers Museum, Oxford. The book is for reference more than to be read through. There is an extensive bibliography and a useful index. It can be highly recommended to those engaged in the teaching of anæsthesiology or those interested in medical history.

Carbohydrate Metabolism. S. Soskin, Director of the Research Institute. 305 pp., illust. $6.00. The University of Chicago Press, 5750 Ellis Avenue, Chicago, Ill., 1946.

In their preface to this book, the authors state that the volume is intended to serve as a correlative text for the teaching of carbohydrate metabolism to students of physiology, biochemistry and medicine, and should also be useful to the practicing physician, who seeks to keep abreast of the fundamentals upon which his clinical applications are based. There is no doubt that, with these purposes in mind, the authors have succeeded notably in their task. From the standpoint of its usefulness to the practicing physician, this text will be invaluable to all who are particularly concerned with diseases of metabolism, with special reference to diabetes mellitus, and will be of interest to any internist or surgeon who attempts to base his practice on sound biochemical and physiological principles.

Although the authors refer frequently to the older literature, the book deals chiefly with knowledge gained during the last twenty years, since the publication of the late Professor J. J. R. Macleod's monograph on "Carbohydrate metabolism and insulin" in 1926. It is during this twenty year period that Dr. Soskin has been active in contributing to the original literature. As a consequence, this book provides not only an excellent review of the entire field, but also a comprehensive picture of the valuable investigative work done by Dr. Soskin and his colleagues.

The subject matter of the book comprises the biochemistry and energetics of carbohydrate metabolism, the nature, occurrence and origin of materials in the body important to carbohydrate metabolism, a critical survey of the classical criteria of diabetes mellitus, the rôle of the endocrine glands in carbohydrate metabolism and, finally, an integration of physiological and clinical aspects.

Principles and Practice of Tropical Medicine. L. Everard Napier, Companion of the Order of the Indian Empire. 917 pp., illust. $11.00. The Macmillan Company of Canada Ltd., New York and Toronto, 1946.

This is a quite complete textbook on the clinical aspects of tropical medicine. While a reasonable amount of space has been devoted to the laboratory side of the subject, it has not been over-emphasized as in some other texts. The treatments delineated are adequate and quite up-to-date. It is refreshing to find a textbook by one trained in the European School of Tropical Medicine which takes a rational view of the value of screens in houses, air conditioning, and light-weight clothing.

It might perhaps have been better to have considered blackwater fever under the heading of malaria, although the author states that he considers it a special manifestation of malaria which has always been the reviewer's point of view. This book would provide a very satisfactory text for anyone desiring the latest and best information in compact form on tropical diseases.

Medical Aspects of Growing Old. A. T. Todd, Honorary Physician, Bristol Royal Infirmary. 164 pp. $4.50. John Wright & Sons Ltd., Bristol; Macmillan Company of Canada, Toronto, 1946.

This little book is written out of the experiences of a wise and observant physician. It cannot be taken as authoritative since it contains some very dogmatic contradictions of current views on nutrition. These are not to be dismissed, however, as the opinions of a crank. They are too well argued for that. At the same time, there is evident prejudice behind some of them. The physiology is sound and the understanding of the health problems of old people is deep. As a contribution to geriatrics the book is valuable and it should be read and put aside for rereading. Treatment is, perhaps, oversimplified but, after all, the correction of maldigestion and the acquiring of proper habits of breathing are basic in dealing with the ills of the aged. The abuse of purgatives and hypnotics is sternly dealt with and the simple rules advocated are easy to follow. An occasional flash of cynical humour appears here and there and the book is packed with common sense.

Renal Diseases. E. T. Bell, Professor of Pathology in the University of Minnesota, Minneapolis. 434 pp., illust. $8.00. Lea & Febiger, Philadelphia; Macmillan Co. of Canada, Toronto, 1946.

This is a "compilation of studies on renal diseases carried out by the author during the past twenty-five years" with certain additions. Although written by a pathologist, an attempt is made to outline the clinical symptoms and findings in relation to the pathology. There are many lists of incidences of various conditions in autopsy material, and it includes extensive data about certain affections of the kidney. For example, there are twelve pages of tables summarizing the findings in chronic glomerulonephritis, and sixty pages of discussion of hypertension. Other diseases are dismissed more quickly, but actually omitted are only a few unimportant or uncommon conditions. There are very extensive lists of references; so extensive that one wonders why other workers are quoted without reference.

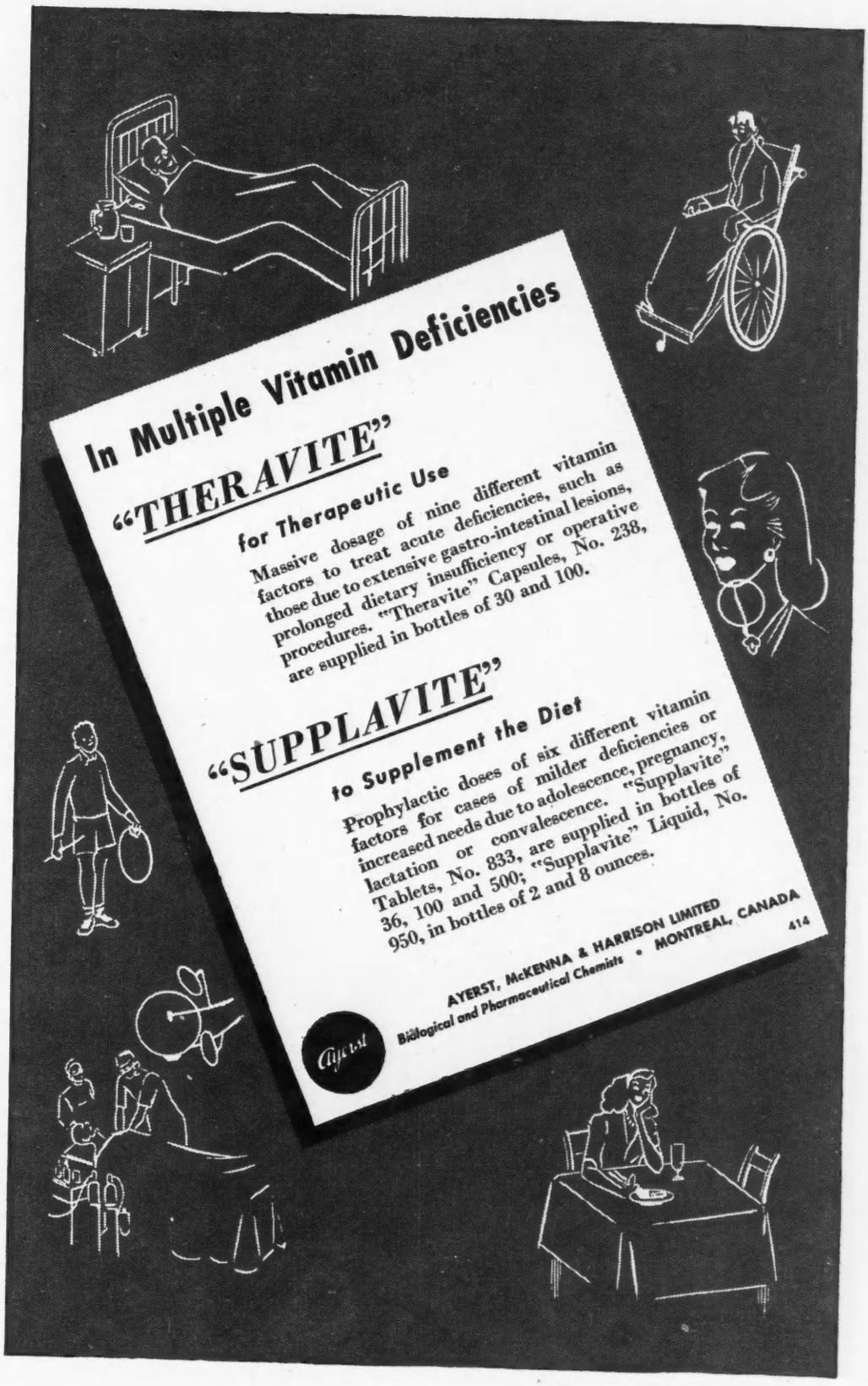
The book is physically attractive, the illustrations are profuse and generally of good quality, and the index although short is quite adequate. There are few typographical errors for a first edition. There are several statements of fact which would be held as highly debatable by other workers, but these are mostly in connection with the clinical urology.

Skin Diseases, Nutrition and Metabolism. E. Urbach, Associate in Dermatology, University of Pennsylvania School of Medicine, 634 pp., illust. $10.00. Grune & Stratton, Inc., 443 Fourth Avenue, New York, N.Y., 1946.

This book contains a good deal of interesting material compiled from the writings of many ancient and modern authors, much also that has long been discarded with good reason. The choice of authorities appears to have been made with an undiscriminating eye. A great deal of the material presented is of a highly controversial nature, although this fact is not given sufficient notice. For the dermatologists and workers in other departments of internal medicine it may be found a convenient reference book as the bibliography is very complete. The general practitioner looking up a short cut to the cure of one of his perennial dermatologic problems will be confused rather than helped. Every variety of food-cultist and dietetic quack who chances to fall upon the book will find some support of a quotable nature for his pet notions.

The tables are numerous but not invariably helpful. In one, for instance, the same foods are listed in both the Prohibited and Permitted columns.

Far too many of the 266 illustrations do not illustrate. They are photographs with captions, and in many cases the photograph might have been supplied with any one of the other captions appearing elsewhere. Without any caption one would often fail to suspect what was being represented. Many are of the "before" and "after taking" type popularly identified with patent medicine advertising. On two successive pages such pairs of photographs appear, one labelled "influence of a low fat diet on psoriasis vulgaris", the other labelled with the same words except that "protein" has replaced "fat". In either case the caption might as well have been "influence of sunlight (or x-ray, or salicylic-white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It is a compilation of a bushel of facts, observations and opinions in which many grains of good wheat may be found by the clear-sighted.

Sir W. Arbuthnot Lane, His Life and Work. W. E. Tanner, M.S., F.R.C.S. 192 pp., illust. $4.50. Baillière, Tindall and Cox, London; Macmillan Co. of Canada, Toronto, 1946.

This short biography is evidently a labour of love. It would be easier to read were it not so condensed and if the material were better arranged. The author has tried to avoid the appearance of hero worship and keeps his evident enthusiasm under very firm rein. He gives examples of the opposition of contemporaries and admits that certain of Lane's conceptions in physiology were not based very firmly on fact. He makes it clear that The New Health League which Lane founded and to which he devoted his later years has justified itself and the zeal out of which it began. Arbuthnot Lane was a great surgeon. His early work on middle ear disease and its sequelæ is in itself enough to perpetuate his fame. His operation for cleft palate has long ago been adopted as a standard procedure and his work on internal reduction and fixation of fractures is fundamental and will perpetuate his name for ages to come. The strange fact is stressed that he became a surgeon because he was disappointed in not attaining a position as assistant physician in Guy's Hospital. His first five years of postgraduate training was taken with such an appointment in view. In this way he missed a grounding in the conservative principles of surgery as taught sixty years ago and brought a fresh view point with his work. It is hoped that the author may extend this study into a larger work. One of the most colourful figures in surgery and one of the great pioneers deserves the tribute.

Ambulatory Proctology. A. J. Cantor, Associate Proctologist, Kew Gardens General Hospital, Long Island, New York. 524 pp., illust. $8.00. Paul B. Hoeber, Inc., New York, 1946.

This is a very practical book which will influence both the specialist and general practitioner. The author has definitely fixed the field of the proctologist, that of the anus, rectum and colon; and places this specialty on a higher basis, requiring extensive surgical training. Early postoperative rising is the present trend of all surgical cases, and applies particularly to proctology, as the majority of cases are minor surgery. If an office is fitted as an operating room, many cases can be treated surgically and sent home, thus materially relieving the acute shortage of beds. Obviously, however, resection of the sigmoid is a hospital procedure. One wonders how many postoperative hæmorrhages Dr. Cantor encounters, but certainly the feeling of well-being the patients speak of after early ambulation will compensate the minor risk.

Several new ideas are also incorporated, namely, Treatment of Prolapse, Melanosis Coli, etc., also an extensive chapter on Intestinal Parasites.

Anatomical Eponyms. J. Dobson, B.A., M.Sc., Manchester. 240 pp., illust. $6.75. Baillière, Tindall & Cox, London; Macmillan Co. of Canada, Toronto, 1946.

The teaching of anatomy as all of us know, has undergone great changes in the last 25 years, in common with medicine generally. But there is one change which has been confined to anatomy alone; that, namely, which is concerned with nomenclature and more particularly with eponyms or the association of men's names with given structures. It is rather curious that anatomy should have been the one science to develop such a difference of opinion regarding this particular form of nomenclature. Other branches of knowledge, geology, botany, biology, chemistry, clinical medicine, willingly enshrine in their phraseology the names of those especially associated with discovery or notable work. And so did anatomy until the B.N.A. revision came into being somewhere in the 1920's. The committee in charge of this went manfully to work on anatomical terms and it was the eponymic terms which suffered most. It should be added that not all the anatomists concerned with the Basle revision were in agreement with the changes in eponyms. There was a definite division of opinion, and the feeling was so strong on both sides that a compromise was agreed on, which later became an almost complete acceptance of the abolition of eponyms.

Now, all the arguments on both sides are most satisfactorily presented in this volume and with a ''sweet reasonableness'' which should leave us, one would hope, in no doubt as to the very great value of eponyms. It may not be possible for a long time to reinstate in anatomical language the names which Gray and Cunningham in earlier editions made so familiar, although there are laudable signs of some of them reappearing here and there. But meanwhile this dictionary will go far to remind students and others of the long list of those who contributed to our knowledge of human anatomy, whilst at the same time constituting an authoritative and detailed source of reference not before assembled under one cover.

Cardiosvascular Disease in General Practice. T. East, Physician and Physician-in-charge of Cardiological Department, King's College Hospital. 198 pp., illust., 2nd ed. 12s. 6d. H. K. Lewis & Co. Ltd., 136 Gower Street, London, W.C.1., 1946.

The second edition of this book, just published in 1938, is a concise statement of the diagnostic problems and therapeutic resources associated with cardiovascular disease. Throughout this short volume there has been a studied avoidance of discussion, of quoting other points of view, of attention to matters not of immediate importance in the care of patients with heart disease by the general practitioner.

The arrangement of the text is along conventional lines. Characteristic of the book are the chapters dealing with heart failure which elucidate the findings, means of diagnosis and treatment, but carefully avoid complicated discussion as to œdema formation or the theories behind its proper treatment. Regarding congenital heart disease the author has selected those which may now be subject to operative treatment and has discussed concisely their recognition and differential diagnosis. In view of the urgency of accurate early diagnosis in the thyrotoxic heart disease, seven pages are devoted to its consideration as compared with five pages on rheumatic heart disease.

There is no chapter on electrocardiography and no electrocardiographic tracings are included. No attempt is made to discuss the fluoroscopic study of the heart but there are a number of cardiac silhouette figures. Scattered throughout are statements as to the place of these specialized methods of study in the diagnosis of heart disease.

Fever Bark Tree. M. L. Duran-Reynals. 275 pp. $3.50. Doubleday & Company, Inc., New York; McClelland & Stewart, Ltd., Toronto, 1946.

A vast amount has been written on the subject of malaria, but most of it has been on the more severe lines of scientific treatises or histories. Since the Japanese attacked the East Indies and vast Allied armies invaded some of the most malarious regions in the world, public interest in the disease and particularly in quinine has grown rapidly. It is high time therefore for an accurate and complete treatment of this whole subject. Mrs. Duran-Reynals's book admirably fills this need. Here Clio, that elusive goddess, has a good couturière to show off her best points.

This is an excellent example of popular historical writing. There is vivid writing free from the excesses that mar so much of this sort of work. Facts are not sacrificed to dramatic effect. First-rate balance is

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—Review in *The Canadian Hospital*, September, 1946.

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preserved with faithfulness to sources (a most interesting bibliography is appended). The theme is vast and contains material for a score of novels. The author fuses her knowledge of history and of medicine to brilliant effect. The whole drama of fevers is presented from ancient times down to the modern industrial struggle for the control of anti-malarial agents; the romantic story of quinine has never been told more delightfully. Here are recreated with a novelist's skill such figures of the past as Francesco Torti, Gideon Harvey, Sydenham, Sir Robert Talbor (too little known to medical men), Mutis, Laveran and Ledger. The narrative gives the reader the account of the Brazilian epidemic of malaria of the last ten years, the amazing story of Java quinine industry, the struggle in which individuals, governments and commercial interests played for high stakes with the more benign medical gods well in the background. The part of malaria in war is set down from Alexander the Great to General MacArthur.

It is well to have the story brought up to date, and here we are in Mrs. Duran-Reynals's debt. The account of the way in which the Allies maintained the production of anti-malarial drugs during the recent war is as exciting as any of the previous chapters in the narrative. Malaria continues to play itself out in a drama that is packed with incident and tragedy. And now that quinine may be superseded by more effective anti-malarial agents, it is of advantage to have its full story set down, together with that of its most recent rival, atabrine.

This book cannot be commended too highly. Here is history on the grand scale concisely presented with full consideration to light and colour. It should make fascinating reading for the lay public, for physicians, and for all those interested in the vital stuff of history.

Human Embryology. B. M. Patten, Professor of Anatomy in the University of Michigan Medical School. 776 pp., illust. $7.00. The Blakiston Company, Toronto, and Philadelphia, 1946.

Dr. Patten has written about human embryology in a fresh and inspiring manner, which is indeed an achievement in a field already crowded with texts. Intricacies of development are unfolded to the reader as if the author were a daily witness to the scene, seeing each process clearly and simply.

This text does not deal with a static embryology of embryos fixed at ten, twenty or thirty millimetres in length. Rather, it presents an organism in transition, continuously developing and growing. This dynamic approach starts with the ovum and follows on in uninterrupted sequence until the fetus is fully formed. Clinical import and function are dominant notes. In short, this is a remarkably good embryology text for student and physician alike.

Human Embryology (Prenatal development of form and function). W. J. Hamilton, M.D., D.Sc., F.R.S.E., Professor of Anatomy in the University of London at the Medical College of St. Bartholomew's Hospital; J. D. Boyd, M.A., M.Sc., M.D., Former Fellow of Clare College, Cambridge; Professor of Anatomy in the University of London at the Medical College of the London Hospital, and H. W. Mossman, M.S., Ph.D., Associate Professor of Anatomy in the University of Wisconsin. The Williams & Wilkins Company, Baltimore, 1945.

This book of 366 pages and 364 figures, many in colours, gives a full view of the human development as seen by specialists of Britain and the United States of America. It is dedicated to the late Professor Bryce of Glasgow and to Dr. Streeter of Baltimore, former director of the Department of Embryology of the Carnegie Institution of Washington. One can hardly read it without being impressed with the enormous amount of brilliant research which has come out of this Institution. For instance, the earliest stages of the human embryo have there been worked out, and also the even earlier stages of the monkey embryo. The presentation is clear and explicit, and the illustrations unusually good, particularly as they appear on coated paper. The volume is authoritative and may unhesitatingly be recommended to medical students and all others desiring to have an up-to-date presentation of this important subject. There are free correlations with ancillary subjects such as heredity and biochemistry.

John and William Hunter. J. M. Oppenheimer, Bryn Mawr College. 188 pp., illust. $6.00. Henry Schuman, New York, 1946.

Any book dealing with the two "crusty" brothers from Lanarkshire who were destined to raise surgery and obstetrics to the level of respected sciences is certain to possess great interest. These two biographical essays of Miss Oppenheimer's, however, have much more interest than pertains to narratives of real life that contain the elements of superb fiction. In admirable historical writing she recreates the Hunters as they are revealed in their relationships with their intimate circle and their contemporaries in the social and political world.

The first essay is a study of John Hunter's brother-in-law, Sir Everard Home, and in particular a review of one of the celebrated incidents in the history of science, Home's burning of John Hunter's manuscripts thirty years after Hunter's death. Miss Oppenheimer's final judgment takes the middle ground. Home's act in her opinion was "not so much a part of deliberate crime as of ordinary human folly and fallibility". He was a man "who was not so much wicked as he was unwise", whose "failings were at once the fruit of his own weakness and of Hunter's greater strength".

The second part of the book is a study of William Hunter in his rôle of anatomist, obstetrician and man of the world. Lacking the dimensions of an all-round study, it is still an interesting estimate of an imperious and ambitions Scot who became a member of the glittering society of eighteenth century London. The author clearly shows that Hunter's contributions to medical progress were greater than is commonly acknowledged, while as a personality he was too much the man of the world.

The book is one of the series of publications issued under the auspices of Yale Medical Historical Library. Mr. Schuman has, as always, favoured the medical profession with a fine example of book-making.

Medical Biochemistry. M. R. Everett, Professor of Biochemistry, University of Oklahoma School of Medicine. 767 pp., 2nd ed., 106 tables. $7.00. Paul B. Hoeber, Inc., New York, 1946.

This work was intended primarily as a textbook, and as such it can be confidently recommended to undergraduates in medicine and to those practitioners who have need of revising their knowledge of biochemistry. This present edition is more massive than most student's texts, but one should not be frightened by the book's size. This is due partly to the finer grade of paper used and partly to the inclusion of numerous topics which are frequently omitted in standard texts. These topics include short discussions of immunochemistry, allergy, the biochemistry of inheritance, chemotherapeutic agents, and steroid compounds in medicine.

Dr. Everett's style is lucid and straightforward. He avoids controversial theories and is didactic to a degree. The result is a simplicity of presentation which is greatly to be desired in a student's book; but in avoiding controversy the appearance of simplicity so gained is perhaps misleading. He uses a wealth of clinical material to illustrate the points he makes. This is done in a very effective way and adds greatly to the book's interest. However, in dealing with the clinical material he is not on such sure ground, chiefly because limitations of space do not permit him to do justice to his topics. For instance, twelve lines on the Rh factor or eight on the biochemical aspects of radium sickness are of little value. As the book is a text on a laboratory subject, this is perhaps not fair criticism, but the point

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is that such brief treatment is of necessity superficial and therefore misleading.

The more strictly physico-chemical parts are especially well done, with clear explanations of such basic phenomena as hydrogen ion concentration, colloids and their properties, structural isomerism, and so forth. There is a very useful section devoted to logarithms and their use which if it had been extended to include an elementary discussion of statistics, would have been even more valuable.

Throughout the book are numerous tables, listing the properties of various compounds, which are of great value The bibliography is extensive and includes references up to January, 1946. A brief addendum on a Guide to Biochemical Literature will inform the beginning student as to the most efficient way of getting information about any given topic. All in all, this edition should further establish the book's popularity.

Injuries of the Knee Joint. I. S. Smillie, Surgeon-in-charge, Orthopædic Hospital, Larbert, Stirlingshire (Scottish E.M.S.). 320 pp., illust. $10.50. E. & S. Livingstone Ltd., Edinburgh; The Macmillan Company of Canada Ltd., Toronto, 1946.

This book represents the concentrated experience of the author during five years with Service personnel: approximately 5,000 cases were seen during this time of which 2,000 were treated in his Orthopædic Unit.

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The first chapter is devoted to a consideration of the importance of the quadriceps and the physiotherapeutic approach to the re-education. Of special interest is his recording of experience with the regeneration of semilunar cartilages and the description of his instruments devised for complete excision of the menisci. The final chapter is devoted to the stiff knee and the importance of the injury in fractures of the thigh and leg is emphasized.

This monograph is a most valuable contribution to the surgical literature and will be an excellent guide to surgeons in this field. It is well written, fully illustrated and of good format.

Morel Mackenzie. R. Scott Stevenson. 199 pp., illust. 15s. Messrs. William Heinemann, Medical Books Ltd., 99 Great Russell Street, London, W.C.1, 1946.

This is the first full length study of a *cause célèbre* of the late nineteenth century to see print. With admirable historical sense Mr. Scott Stevenson, himself an otolaryngologist, has set down a well-written and fully documented narrative of the strange and dramatic episode in which a distinguished Victorian physician was caught in the violent and muddy currents of European politics. It is a tragic tale, and students of medical history will be glad to have it fully set out between the covers of one book.

Sir Morel Mackenzie is justly regarded as the founder of laryngology. He was a man of great talents, the first protagonist of the scientific study of disease of the throat in the English-speaking medical world, the founder of the first hospital for diseases of the throat in the world, and the author of the pioneer classic on the subject, *Diseases of the Throat and Nose* published in 1880. He had a distinguished medical and social career. But he was a man of complex and contradictory character. Gifted with many fine traits, he was a man of great pride, apt to be bellicose and hot-tempered and, in modern phrase, a bit of a show-man. These qualities which enabled him to do battle for the new throat specialty against a hostile profession, ironically and tragically implicated him when be became entangled in a case which involved the European political scene whose master at the time was the powerful and crafty Bismarck.

In 1887 Mackenzie was summoned to examine the Crown Prince Frederick of Germany, later for ninety-nine days Emperor Frederick III, and the father of Kaiser Wilhelm II. Frederick had a growth on one of his vocal cords, and the majority of his German medical advisers, believing it to be malignant, had advised removal of the larynx. Mackenzie secured two bits of the growth for biopsy which was carried out by Virchow and reported benign. As a result no operation was performed, and Mackenzie was manœuvred into a position by whihc the responsibility for the whole case was his. From that time on, and more so after the Emperor's death, a storm of controversy and the most malignant charges—medical and political—broke about Mackenzie's head. Most unprejudiced observers and particularly Frederick, his wife and family believed that Mackenzie did the right thing, and in the long run made his patient more comfortable. On Mr. Scott Stevenson's summing up of the evidence there seems to be no question but that Mackenzie made his diagnosis in good faith and not for political reasons so that the pro-English Frederick might ascend the throne. Unfortunately, stung by the torrent of abuse, Mackenzie was ill-advised enough to publish in popular form a defence of himself, *The Fatal Illness of Frederick the Noble*, in which he dealt as savage blows as he received. This brought down upon his head the censure of the British profession, involved him in a libel action and threw a cloud over his last years, and—as has transpired—over his subsequent reputation.

Mr. Scott Stevenson deserves our thanks for bringing the whole sad story into proper perspective. He not only gives us a fine character analysis, but paints a vivid backdrop of Victorian England and the medical world of the period. His achievement reminds us of the fine study of another tragic figure of the same period, Sir William Wilde (Oscar Wilde's father) written by Dr. T. G. Wilson four years ago. It is greatly to the credit of our British medical colleagues to find such first-rate writers in their ranks.

Ocular Prosthesis. J. H. Prince, Late Regional Association Lecturer in "Comparative Ocular Anatomy". 134 pp., illust. $5.25. E. & S. Livingstone Ltd., Edinburgh; The Macmillan Co. of Canada Ltd., Toronto, 1946.

This book fills a long existing need. It forms a complete treatise on the history, manufacture, and fitting of ocular prostheses. Though principally designed for the technician in this field, in that it goes into considerable detail regarding the anatomy and physiology of the orbit, none the less it will be read with profit by the oculist.

Practical Handbook of Midwifery and Gynæcology. W. F. T. Haultain, Obstetrician and Gynæcologist, Royal Infirmary, Edinburgh, and C. Kennedy, Assistant Obstetrician and Gynæcologist, Royal Infirmary, Edinburgh. 388 pp., illust., 3rd ed. $6.00. E. & S. Livingstone, Edinburgh; Macmillan Co. of Canada, Toronto, 1946.

This book follows the pattern of previous editions, discussing the various divisions of obstetrics and gynæcology in a brief, synopsized form. Chapters have been added on the infant, use of x-ray in obstetrics and gynæcology, the therapeutic use of hormones and drugs in labour. The chapter on x-ray simply enumerates various conditions in which x-ray may be helpful. Only two and a half lines are devoted to x-ray measuration of the pelvis. The therapeutic use of penicillin is mentioned only once in the book and then for the treatment of gonorrhœa. Dosage and method of administration are not discussed. The rh factor is briefly mentioned in the chapter devoted to the infant, but its importance in transfusion and obstetrical practice is ignored. It is included as a cause of abortion along with a list of about thirty other causes. The chapter on hormones lists various commercial preparations and enumerates broad indications for their use. One is surprised to find pelvic drainage recommended if signs of peritonitis develop during the puerperium, and hot vaginal douches

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advocated for delayed labour due to a slowly dilating cervix.

The subject matter is presented in such a brief and synopsized form that the book is not suitable as a text for students. It might prove of value, however, for concentrated review before examination.

Peptic Ulcer. I. W. Held, Consulting Physician, Beth Israel Hospital, New York, and A. A. Goldbloom, Assistant Clinical Professor of Medicine, New York Medical College and Flower-Fifth Avenue Hospital, New York. 382 pp., illust. $6.50. Charles C. Thomas, Springfield, Illinois, 1946.

As mentioned in the foreword the authors include in their monograph all types of peptic ulcer and deal with the subject from every angle, though they have avoided prolonged theoretical discussions.

Part 1 deals with simple ulcer, gastritis, and functional dyspepsia. Part 2 includes ulcer with complications. Chapters are devoted to punctures, perforations, retention, hæmorrhage, and malignant degeneration. The indications for medical and surgical treatment are outlined in detail.

The book is well illustrated and each chapter includes a good bibliography. The subject is well covered without too much theory or detail.

Problem of Lupus Vulgaris. R. Aitken, Lecturer in Diseases of the Skin, Edinburgh University. 69 pp., illust. $4.50. E. & S. Livingstone Ltd., Edinburgh; Macmillan Co. of Canada, Toronto, 1946.

This monograph is written by a world-recognized authority on lupus vulgaris. There is an excellent chapter on clinical features and treatment. The next chapter on ultra violet irradiation is one of the clearest descriptions of the Finsen and Finsen-Lomholt lamps that I have read. Tuberculin treatment of lupus is then described and discussed by one who has had much experience. The final chapter is on the problem of lupus vulgaris. The author makes a plea for notification of the disease by all practitioners, and then for proper treatment of these cases in properly equipped treatment centres. He urges that all cases of lupus vulgaris be allowed to live normal lives by having their disease treated and arrested early and then being accepted by society. It is unfortunate that there is no plea for public health measures to attempt to stamp out lupus entirely.

Recent Advances in Neurology and Neuropsychiatry. W. R. Brain, Physician to the London Hospital and the Maida Vale Hospital for Nervous Diseases; and E. B. Strauss, Physician for Psychological Medicine, St. Bartholomew's Hospital. 363 pp., illust., 5th ed. $5.75. The Blakiston Company, Philadelphia; McClelland & Stewart, Limited, Toronto, 1946. Reprinted 1946.

The American edition of this work maintains the high standards set by other volumes of the "Recent Advances" series. It consists of a series of papers summarizing the more noteworthy innovations together with a critical judgment of each. The result, therefore, resembles the fruit of much journal reading and experience by an expert rather than the didactic orderly presentation of a textbook. In a sense this book, like its companion volumes, falls between two stools: its very nature precludes its use as a textbook by students and interns, while its small size and unavoidably brief presentation limits its value to the specialist. It should, however, find a useful place as supplementary reading for both classes of readers, and should be of special interest to the general practitioner wishing to revise his knowledge of nervous diseases.

This edition marks a change in title from "Recent Advances in Neurology" to the present one: and in the preface the authors are at great pains to emphasize the close relationship which must necessarily obtain between neurology and neuropsychiatry. The book's cover, however, adheres to the former title; and the book itself is limited fairly sharply to neurology. The only psychiatric topics discussed are the physical methods of treatment of the neuroses and psychoses (electroconvulsive therapy and prefrontal leucotomy); electroencephalography in neuropsychiatric disorders: the psychological effects of head injuries; and various neurologic questions of interest to the psychiatrist such as the nature of sleep, the physiology of the emotions, and so forth.

Squint and Convergence. N. A. Stutterheim, State Medical Qualification, Holland. 90 pp., illust. 15/-. H. K. Lewis & Co. Ltd., London, 1946.

This small book in reality is a monograph outlining the author's opinions regarding the causation of concomitant strabismus, and its treatment. The author's thesis regarding these matters is that the concepts commonly in use today are inadequate. He believes that fusion is not an entity, but a physiological phenomenon, a mere result itself. He centres the fusion of binocular vision about convergence. The development of his thesis makes entertaining and stimulating reading, though he has a disturbing faculty of expressing hypotheses in the form of dogmatic fact. For this reason his book is not suitable for the student. However, those who have an intimate knowledge of this particular field will find it thought-provoking.

BOOKS RECEIVED

Chemical Composition of Foods. R. A. McCance and E. M. Widdowson. 2nd ed., 156 pp. 6s. 0d. Medical Reserch Council, 38, Old Queen Street, Westminster, S.W. 1. His Majesty's Stationery Office, London, 1946.

Clinics. Edited by G. M. Piersol, Professor of Medicine, University of Pennsylvania. 271 pp., illust., vol. IV, No. 5, J. B. Lippincott, Philadelphia, Pa.

Human Torulosis. L. B. Cox, Honorary Neurologist, the Alfred Hospital, Melbourne. 149 pp., illust. $2.51. Melbourne University Press, Carlton, N. 3, Melbourne, Victoria; Oxford University Press, Melbourne and London, 1946.

La Paralisis Infantil Epidemica. M. E. Glanzmann, Professor de Pediatria de la Universidad y Jefe del Hospital Infantil Jenner, de Berna. 33 pp., Illust. Ediciones Byp, Calle Calabria, 66 a 176, Barcelona, 1946.

Problems of Family Life. Agatha H. Bowley, Psychologist, the School Psychological Service, Leicester. 98 pp. $1.50. E. & S. Livingstone Ltd., Edinburgh; The Macmillan Co. of Canada Ltd., Toronto, 1946.

Results of Radium and X-ray Therapy in Malignant Disease. Ralston Paerson, Margaret Tod and Marion Russell. 147 pp. 7s. 6d. ($2.50). E. & S. Livingstone Ltd., 16-17 Teviot Place, Edinburgh; Macmillan Co. of Canada, Toronto, 1946.

Sanitary Science Notes. H. Hill, Sanitary Inspector and E. Dodsworth, Sanitary Inspector. 135 pp. 7s. 6d. H. K. Lewis & Co. Ltd., 136 Gower Street, London, W.C.1, 1946.

Some Minor Ailments of Childhood. B. Twyman, M.B., B.S. 32 pp. $0.32. E. & S. Livingstone Ltd., Edinburgh; Macmillan Co. of Canada, Toronto, 1946.

Tumores Glomicos. F. Martorell. 110 pp., illust. Editorial "Miguel Servet", Barcelona-Madrid, 1940.

Annual Reports. How to Plan and Write Them. B. K. Tolleris. $1.00. National Publicity Council, New York, 1946.